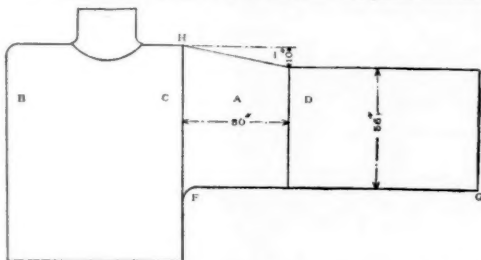


## FRIDAY, JULY 26.

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### Cross Stays in Boilers.

I would like to propound a question to the readers of the *Railroad Gazette* which has been a subject of considerable discussion among locomotive boiler makers of late. It is with reference to the use of cross stays at the point marked



A on the inclosed sketch, the boiler being a true circle in section at the points marked B, C and D (the section being made vertically in each case), when the dimensions of diameter of shell and length and rise of wagon top are as noted on the sketch. If you will call the attention of your readers to this query you will greatly oblige

U. R. S.

74 WALL STREET, New York.

Mr. Lyne, in your issue of the 12th inst., speaks of an "elastic or springy substance used in place of waste" for oiling car journals, as if such a method were still in a tentative stage.

It is so, doubtless, in this country, but in Europe it is long since such a barbarous method as that in use with us has been the practice. In that part of the world every journal box has its spring oiler with wicking extending down into a closed oil chamber below, as described in the *Railroad Gazette*, pp. 771 and 772, 1885, and p. 296, 1886.

This fact, coupled with systematic periodic oiling of all the stock, as explained in the *Railroad Gazette* at the same time, has for result that hot boxes are very rarely met with.

Our railroad officials are very apt to pride themselves on their exemption from this complaint, but circumstances are rather against their pretensions. On the last trip I took out West I experienced three on the trains upon which I traveled. It is true they did not cause much delay, inasmuch as the car inspecting force was well provided with appliances for their cure. These consist, in one of the great stations of the country, of a little truck mounting a water cask, and supplied with a hose and all necessary materials for cooling, greasing or changing out refractory bearings.

This is one of those cases where an ounce of prevention is worth a pound of cure, and in spite of the decision of the Master Car Builders' committee last year that no change is needed, I cannot believe that we shall go on indefinitely oiling journals through the medium of "dope" and dirty waste.

W. HOWARD WHITE.

AURORA, Ill., July 15, 1889.

For years past the railroads have gradually improved their rules regarding flagging and protection of trains. There was a time when the rear brakeman acted on his own judgment, as to going back to flag in case of obstruction to track; but that time has passed, and now he is required by rule to go anyhow and flag as per rules laid down, and those rules are iron-clad. He must go a certain distance, whether trains are due or not, and flag approaching trains, using torpedoes as an extra precaution.

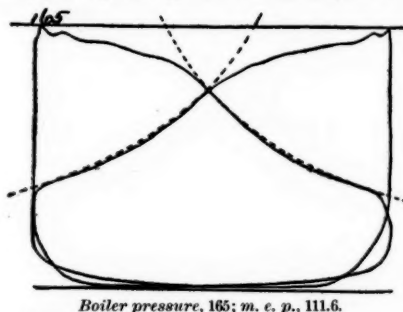
Now, if torpedoes are an "extra" precaution, I cannot un-

derstand how the gentlemen of the General Time Convention could overlook the fact, as they have done in Rules 99 and 99a. \* \* Rule 99a reads: "When on a curve or down grade the flagman must go back a distance of at least ten poles farther (that is 25 poles) *before* placing torpedo."

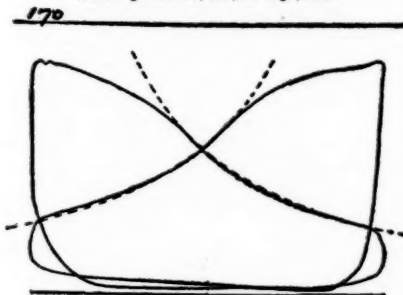
Here is the weak point in the rule. Suppose that a flagman starts back to flag on a down grade and a curve or during foggy or stormy weather; he must not, according to this rule, place any torpedoes until he reaches the 25th pole from the rear of his train. Or, suppose again, that the weather is bad, a sleet storm, making icy traveling for the flagman; he has bridges to cross; he slips and falls and breaks a leg when twenty poles back, and cannot then protect his train. Where then is the virtue of the rule and how is the torpedo a "extra" safeguard? It certainly is not an extra safeguard in the case, and I am surprised that a convention of expert railroad men should adopt such a rule. If torpedoes are to be used as an *extra precaution*, then there is no doubt they should be used plentifully in such cases as I have outlined. The flagman should not wait until he is a full half mile from the train before placing any torpedoes, but should place one immediately on starting back to flag, and then place one every 100 yards. Only in this way can the *extra precaution* be secured; and that is what is needed at such times.

TO THE EDITOR OF THE RAILROAD GAZETTE:

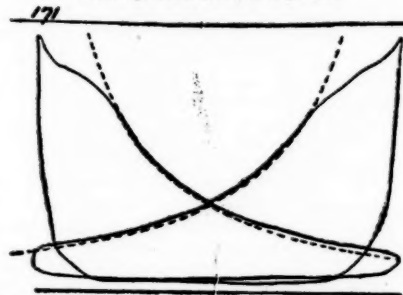
I have noticed Z's communication in your issue of June 28, and his criticism of Mr. Dean's position. Mr. Dean is able to defend himself in any engineering controversy; but I would like Z to answer some plain questions relating to the work performed by Strong locomotives, or by locomotives fitted with the Strong valve-gear. I inclose some indicator diagrams taken from the cylinders of locomotive No. 383, Lehigh Valley Railroad, this being an ordinary locomotive in everything but the cylinders and valve-gear. These diagrams show the merits of the engine, which are also proved by the work done, and the testimonials received from engineers, conductors and trainmen who have traveled behind this locomotive during the last four years. The cylinders are 19 x 24, and the grate-surface is 37.12 sq. ft. The locomotive draws 9-car trains up a 38 ft. grade 16 $\frac{1}{2}$  miles in 21 minutes, and has taken



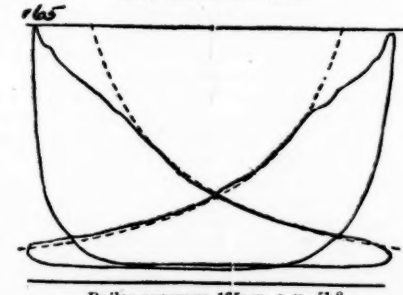
Boiler pressure, 165; m. e. p., 111.6.



Boiler pressure, 170; m. e. p., 84.1.



Boiler pressure, 171; m. e. p., 59.8; speed, 40.44; revolutions, 206.2; total I. H. P., 834.6.



Boiler pressure, 165; m. e. p., 51.8.  
Indicator Diagrams, Strong Locomotive No. 383.

6-car trains (including two parlor cars) over 12 miles of a 96 ft. grade in 19 minutes. When tested in comparison with engine 357 of the same company—this engine having 20 x 24 cylinders, 39.2 sq. ft. of grate-surface, 200 sq. ft. of heating surface more than engine 383, and being one of the smartest 20 x 24 locomotives in the country—engine 383 showed an efficiency 20 per cent. greater than that of the locomotive with link-motion, together with a saving of 20 per cent. in the weight of steam used per indicated horse power. Although the cylinders of No. 383 are only 19 by 24, while those of No. 357 are 20 x 24, the former engine can take 11 cars over the 16½ miles of 38 ft. grade in the same time as No. 357 can haul 9 cars.

In reference to back pressure, I may state that the fuel used in engine 383 is Wyoming Valley coal, which contains a large quantity of slate and other incombustible matter, and makes an ample supply of steam with  $4\frac{1}{4}$  in. double nozzles. The throttle valve is  $7\frac{1}{2}$  in. in diameter, the steam-pipe the same size, and the passages have corresponding dimensions. The engine works very freely at high speeds, as do all the engines fitted with this valve-gear, and it is submitted that the foregoing comparison demonstrates the value of the valve-gear. Every one familiar with the operation of a locomotive knows that when the horse power developed, as compared with heating surface, is very large, a certain velocity of the escaping exhaust is required to supply the air for rapid combustion; and that a certain contraction of the exhaust nozzle is necessary to give this velocity. Now, considering the development of an indicated horse power for each sq. ft. of heating surface, as obtained with No. 444 when indicating 1,810 horse power, on the Northern Pacific Railroad, or the development of an indicated horse power for  $1\frac{1}{4}$  sq. ft. of heating surface, as obtained with No. 383, on the Lehigh Valley Railroad, when the cards submitted were taken, if the amount of horse power developed per pound of back-pressure is examined, it will be found that the back-pressure of Strong locomotives, as compared with that of ordinary locomotives burning the same grade of coal, is very low.

As to the admission, at equal speeds, it is certainly much superior with the Strong valve-gear, and the compression is ideal, being capable for any desired adjustment. The practical proof of the superior efficiency of this valve-gear is found in the fact that ordinary trains can be hauled at a high velocity with a very short cut-off, it being necessary to lengthen the cut-off under the same conditions when using ordinary engines; the ratio of cut-offs, with the two types of valve-gear, being about as 4 to 8. Moreover, an engine having the Strong Valve-gear will haul trains with 80 lbs. boiler pressure and a 6-in. cut-off; while an ordinary locomotive will require, for the same service, a boiler pressure of 140 lbs. and a cut-off of 8 in. In the language of a runner: "She is as good with 80 as my engine is with 150;" and another remarked: "I like this engine because she does not 'set back' and begin to lose time if the pressure drops back on her from any cause."

Another strong point in favor of the improved valve-gear is the fact that a locomotive with small driving-wheels will make very high speed when hauling heavy trains; as illustrated by the run of No. 444, from Fort Wayne to Chicago, hauling a 10-car train at an average speed of a mile a minute; the same engine, on the Northern Pacific Railroad hauling 12 cars—7 Pullman and 1 dining-car included—10.8 miles in 11 minutes, from dead stop to dead stop; and on the same day hauling 14 cars weighing, with engine and tender, 750 tons, up an 86 ft. grade; the mean effective pressure being 150 lbs., with a boiler pressure of 170, and the pull on the draw-bar being 28,500 lbs., or one-fourth of the weight on the driving-wheels.

It would be easy to multiply examples similar to those already cited which show clearly that the work performed is due to the valve gear, since ordinary locomotives with the same boiler pressure and cylinders of the same dimensions have failed to equal this performance when handled by the same or by equally experienced runners.

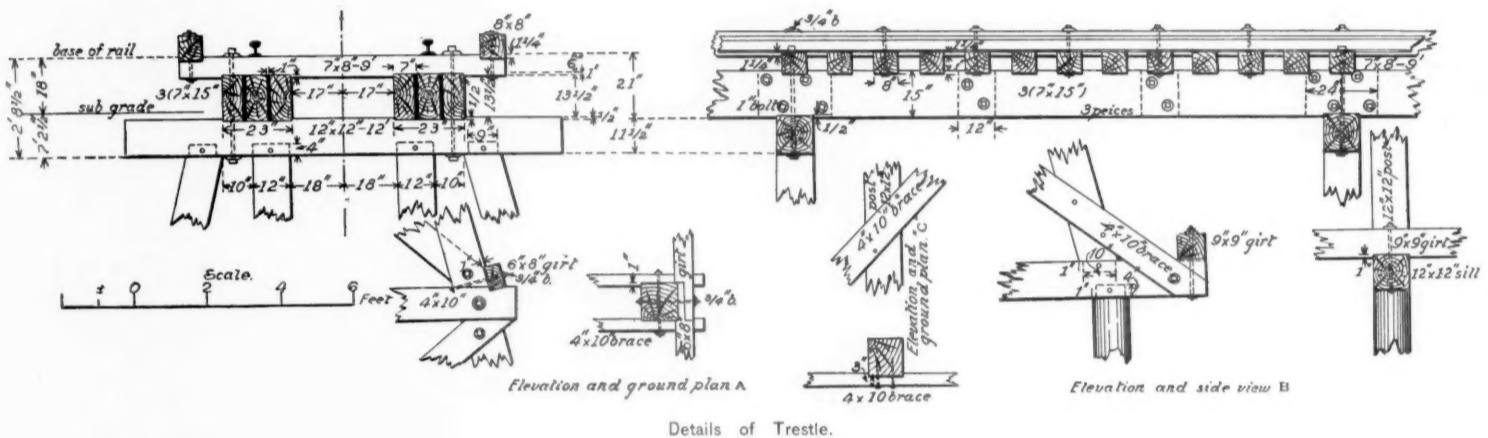
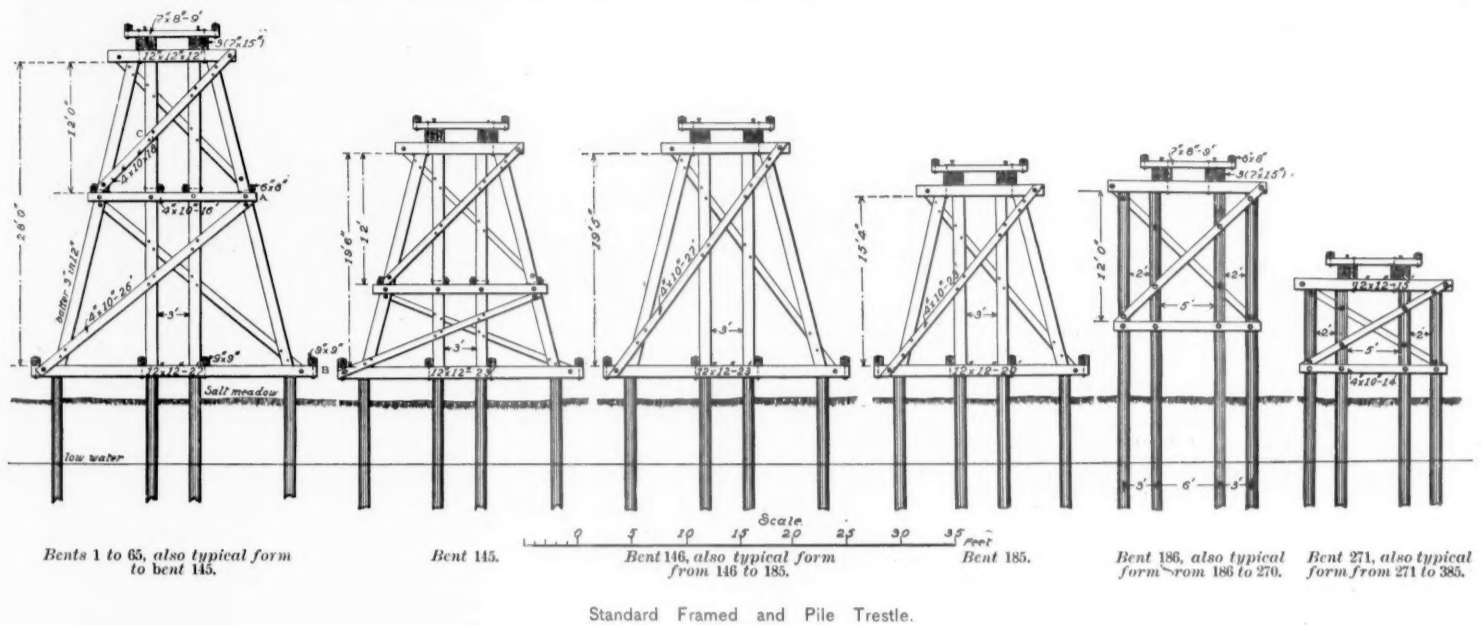
Will Z tell us why this should be so, if the valve-gear has no valuable features?

TABLE OF CYLINDER PERFORMANCE, ENGINE NO. 383.				
Diameter of cylinders, inches.....	19			
Stroke of piston, inches.....	24			
Cylinder displacement per stroke, cu. ft.....	3.925			
Clearance, cu. ft.....	0.259 = 6.58 p. c.			
Diameter of driver, inches.....	65 $\frac{3}{4}$			
Number of revolutions per mile.....	365.87			
No. of indicator diagram.....	5	6	7	8
Date.....	May 10, 1887.	May 2, 1887.	May 2, 1887.	May 10, 1887.
Speed, miles per hour.....	40.44			
No. of revolutions per minute.....	206.2			
Boiler pressure.....	165	169	170	170
Mean effective pressure.....	111.6	84.1	58.9	51.8
Total indicated horse-power, two cylinders.....	834.6			
Steam accounted for at release, lbs.....	1.5191	1.1085	0.8423	0.8304
Steam retained by exhaust closure, lbs.....	0.0843	0.0957	0.1236	0.1721
Steam used per rev. by one cylinder, lbs.....	1.4348	1.0738	0.7187	0.6583
Total steam used per hour, lbs.....	17780			
Steam used per 1 h. p. per hour, lbs.....	22.24	22.29	21.30	22.15

GEO. S. STRONG.

**The Martin Anti-Fire Car-Heater Company.**

Although the use of continuous systems of train heating has with most roads not yet got out of the experimental stage, the manufacture of apparatus for heating trains by steam is actually an established industry on a commercial basis. One company which is not merely an owner of pat-



EAST APPROACH TO ARTHUR KILL BRIDGE.

ents, but a manufacturer, is the Martin. The works of this company at Dunkirk, N. Y., are completely equipped for the manufacture of all special fittings and for working up and erecting the material for steam heating for cars and buildings. The shops have turned out complete heating equipment at the rate of 50 cars a day. Their present capacity is probably about 75 cars a day.

Up to May 1, 1889, the company had equipped with the Martin system 2,661 cars and 907 locomotives. Since May 1 the orders received amount to about \$21,000.

The buildings cover an area of about 12,500 square ft., with yard room ample for storage and for any probable needs for future expansion. The Lake Shore tracks run close to the doors of the works, and a trestle is now building to take a narrow-gauge track into the yards to dump coal, iron and other material right where it is wanted. The works include machine shop, pattern, erecting and fitting and blacksmith shops, brass foundry and iron foundry. All iron and brass castings for the fittings are made here, a special mixture of iron being used. The core oven in the iron foundry is particularly well arranged, having been especially designed for the work by Mr. D. A. Barnes, the mechanical superintendent.

The power is supplied by a Rice automatic 50 horse-power engine. The machinery includes all the tools necessary for making the special parts required by the system and for the pipe fitting. Among the tools are several that have been specially designed by Mr. Barnes for the work of this company. One of these is a tool for turning the balls used in the ball joints, which dresses both inside and outside faces, and is for its purposes a more efficient tool than anything that can be found in the market. A tool for cutting and threading pipe, also designed by Mr. Barnes, has decided merits, and we hope to illustrate it shortly. A tool for tapping fittings, to be entirely automatic in its action, is now constructing at the shops of the company, also from Mr. Barnes' designs.

The company is now supplying for new work its new ball joint in place of the slip joint heretofore used. This joint will also be substituted for the old one on more or less equipment now in service, but to what extent this change will be made is not yet known. This joint was in experimental use all winter, particularly on the Boston & Albany, and is said by Mr. F. D. Adams to be entirely satisfactory. The coupling used is not changed, merely that part of the device which is intended to secure flexibility in the metallic connections. The coupling is also furnished with hose connection for those who prefer it.

The company is now ready to offer a system for heating by hot water circulation, the water being heated by steam from the engine, or by an independent heater. The water is heated by a radiator placed in the boiler which surrounds the fire pot.

The Baker piping is used, and the boiler is designed to fit on the base of the Baker heater. Either steam from the engine or fire, or both together, can be used to heat the water. The shell of the boiler is made of seamless steel tube, and is very neat and compact. We expect shortly to illustrate both the new joint and this combination heater, and, therefore, will give no further description now.

The simple regulating valve now used in the system was exhibited at the conventions, and was seen by many of our readers. It promises to be effective in automatically regulating the steam pressure in the radiating system.

#### The Arthur Kill Bridge Approaches.

The line by which the Baltimore & Ohio Railroad will reach deep water at Staten Island leaves the Central of New Jersey at a point near Cranford Station, about 5½ miles from the Arthur Kill Bridge. Coming from the west, the line crosses the Pennsylvania Railroad by an overhead bridge, consisting of a through span 150 ft. long and trestle approaches of about 2,600 ft. The gradients of the approaches are 0.5 per cent. on the west side and 0.7 per cent. on the east side. There are about 3,800 ft. of trestle approach to the Arthur Kill Bridge from the west, with a deck span of 100 ft. over South Front street in Elizabethport, and a through span of 200 ft. over the New York & Long Branch Railroad and Bay Way. In all there are nine grade crossings of highways of more or less importance. The connection of this new line with the Central of New Jersey and the Lehigh Valley, with a portion of the survey and location of 1885-6, are shown on the sketch map herewith.

The Arthur Kill Bridge was shown and described in the *Railroad Gazette* of June 29, 1888. It has a draw span of 496 ft. 6 in., from centre to centre of end pins, and two fixed spans, one at each end, of 150 ft. The trestle approach from the west is on a uniform grade of 0.5 per cent. On the Staten Island side there is a trestle of about 5,800 ft., of which 2,800 ft. is framed trestle and 3,000 pile trestle. This approach has a uniform gradient of 0.7 per cent.

The general alignment is shown in the sketch map, and we illustrate the design of the Staten Island trestle in considerable detail. The plans and specifications are by Mr. Charles Ackenhell, Chief Engineer Baltimore & New York Railroad, and have been standard with him for many years. The drawings are so complete as to require but little description.

The piles are driven through mud and a stratum of sand and gravel into a stratum of red clay, as shown on the diagram. They are driven to depths varying from 28 to about 45 ft. The total number of bents is 385, placed 15 ft. from centre to centre. Of these, 185 are framed trestles on pile foundations and 200 are pile trestles. The framed bents are from 15.4 ft. to 28 ft. in height from bottom of cap to top

of sill, and are unusually stiff and heavy. There are four piles in each bent, capped with 12 x 12-in. yellow pine caps. Each pile under the framed trestle has a tenon. On the pile trestle only the outside piles have a tenon, the inside piles being drift-bolted to the cap. The piles are all of new-cut timber, with the bark taken off from low water to the sills, or in the case of the pile trestle, from low water to a height of 8 ft. The peeled portion of the piles is required to be treated with Wilmington tar or some similar preservative. The piles are of Virginia pine, not less than 13 in. in diameter where cut off at the top, and 10 in. at the point. They are driven with a 2,500-lb. hammer, falling 10 ft., each pile to be driven until the last ten blows will not drive it more than 1 ft. In case a pile is driven too low to be cut off at the required grade, it must be drawn and another driven in its place.

All the timber of the trestle is yellow pine, either Georgia or Florida. The track stringers are three-ply, packed chords of 7 x 15 in. sticks, 30 ft. long, with a shoulder of about ½ in. on the caps. These stringers are secured by bolts through the ties and the caps, as shown in the drawings. The caps are 12 x 12 in. by 12 ft. long, with four mortises for the posts. On the pile trestles they are 15 ft. long with two mortises only, being drift-bolted to the inside piles. The inclined posts have a batter of 3 in. per foot and are tenoned into the caps and sills. It will be noticed that they do not enter the same tenons with the upright posts at the caps. The horizontal bracing is 4 x 10 in., notched one inch at the posts and bolted to all of them. The diagonal bracing is also 4 x 10, notched 1 in., and spiked and bolted as shown.

The longitudinal bracing or girth is 6 x 8 in. at the first story of the trestle and 9 x 9 in. on the sills. These girths are all bolted either to the posts or to the sills, as shown. It was desired to make the trestle very stiff longitudinally, as the piles stand some 25 feet in soft mud.

All mortises, tenons, pile heads, caps and all places where one timber crosses another are treated with dead oil or fennel. The cross-ties are of white oak. The timber in the trestle and track floor includes 940,000 ft., board measure, of yellow pine and 200,000 ft. of white oak cross-ties. The piles are about 1,540 in number. The iron in spikes, drift bolts, screw bolts and washers amounts to 81,000 lbs.

#### "Checking" Baggage in Germany.

When you present your trunk at the baggage-room of a German railroad station, if you look into the office where the clerk in charge of the "expedition" of baggage has his place, opposite the scales on which the trunks are weighed, you will find him armed with pencils and a pair of scissors, busily engaged over a book of blank forms, the pages of which are 25

in. wide—that is, 4 in. wider than the *Railroad Gazette* when wide open. A strip about 1½ in. high entirely across this page is devoted to each shipment of baggage—not to each piece, for as many as four different pieces may be shipped on one receipt. By the aid of his scissors the clerk can divide this strip into eight different pieces, including the stub, which remains in the book, and is the station record of baggage shipments. On each of these pieces is printed the same current number, which is the number of the shipment—like the consecutive numbers on passenger tickets. On the left-hand side of the stub the clerk enters the date and the train number, in columns therefor provided; on the right-hand side of it the total weight and the excess weight, if any, over the 55 lbs. carried free, and the payment, if any, for overweight, or on back charges, while the body of the stub reads:

2 pieces of baggage—1 tickets.  
No. 72.  
From Berlin,  
To Frankfort,  
Via.....  
Declared value.....  
Declared interest.....

The name of the shipping station is printed in the blank, and also that of the destination, if there is a great deal of travel between the two stations. An assistant station agent, who has been writing to the *Journal of the German Railroad Union* on the subject, says, that of 452 stations to which his station issues tickets, 111 have blanks with the names printed, and the 111 books of blanks must make a goodly array. As, however, the names of the stations appear at least four times in the blanks, and once more for every piece of baggage over one, it is evident that the saving in time by printing is not to be despised. In most cases no name would be necessary after the "via," nor would there be any entry after the "Declared value" and "Declared interest," the former being given only when the passenger wishes to secure an indemnity in case of loss greater than that allowed when there is no declaration, and the latter being his statement of the damage he will suffer if the trunk doesn't arrive on time. If he makes these declarations, he pays for them what is equivalent to insurance; but probably not one passenger in a thousand makes them.

Following this record (stub) comes the train baggage-master's coupon, which is about 2 in. long, reading, "— pieces of baggage, — weight, —; No. (consecutive) of shipment —. From — station to —, via —." These are not cut from the book separately, but all that go in one train may be left till the last receipt is given, when they may be cut out a page at a time, one being just above the other, and usually ten on a page. If the destination is printed on this, the only writing required on it is the number of pieces of baggage and the figures for the weight.

Next comes the passengers' part of this stationery—the baggage receipt, a slip 6½ in. by 1½ in., the form of which is approximately as follows:

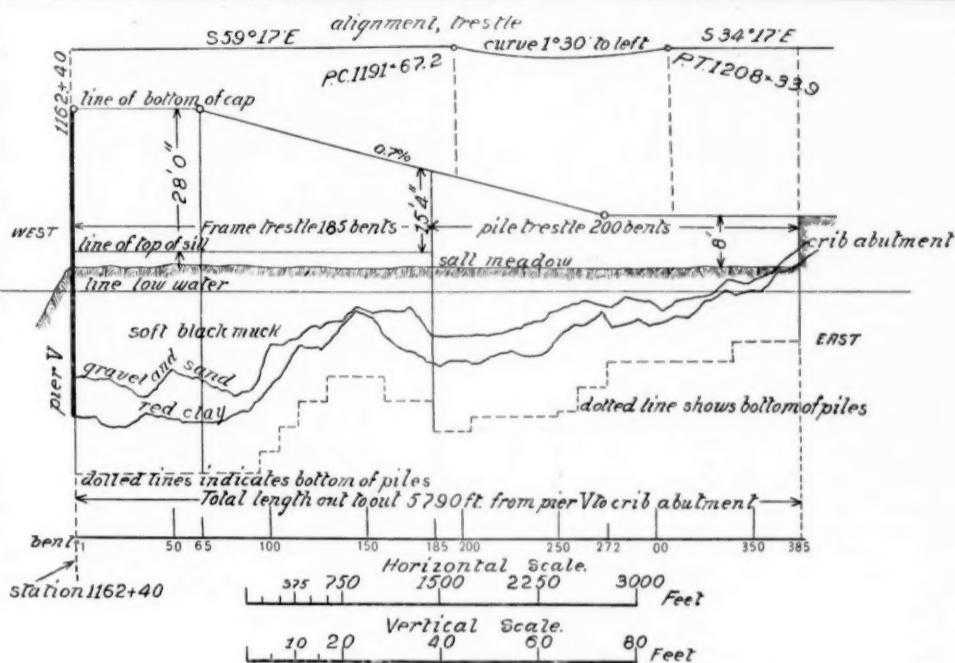
On delivery of this receipt the article herein described will be delivered at the station to which it is directed.

for..... pieces of baggage = .....	..... tickets, from.....
Change for..... lbs. overweight. Paid..... \$.....	to.....
Change therefor.....	Via.....
Delivery on time declared to be worth.....	Charge therefor.....

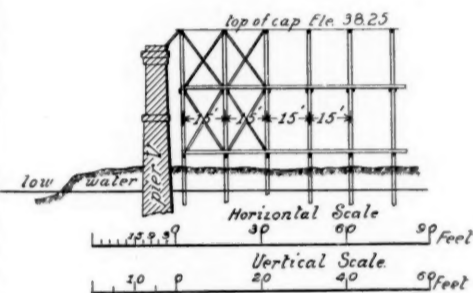
Forwarded in accordance with the requirements of the Regulations for the working of the German Railroads.

Here the clerk has to fill in the train number and the date, the number of pieces of baggage and their (total) weight, and the number of tickets presented. If there is overweight, he must fill in the figures for it and for the charge. The name of the delivery station may also have to be written in, and, in rare cases, four other entries of figures.

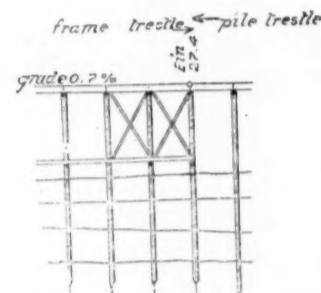
The remainder of this strip consists of the labels to be pasted on the baggage, each about 1½ in. square, but only one required for a single piece of baggage. Each bears the consecutive number of the shipment (which, as we have put it on the receipt, is 72) in very large figures (½ in. high), and underneath the address, "From — to —, via —." The name of the shipping station is always printed, and that of the destination may also be. If not, the clerk fills it in on as many coupons as there are pieces of baggage, cuts them off



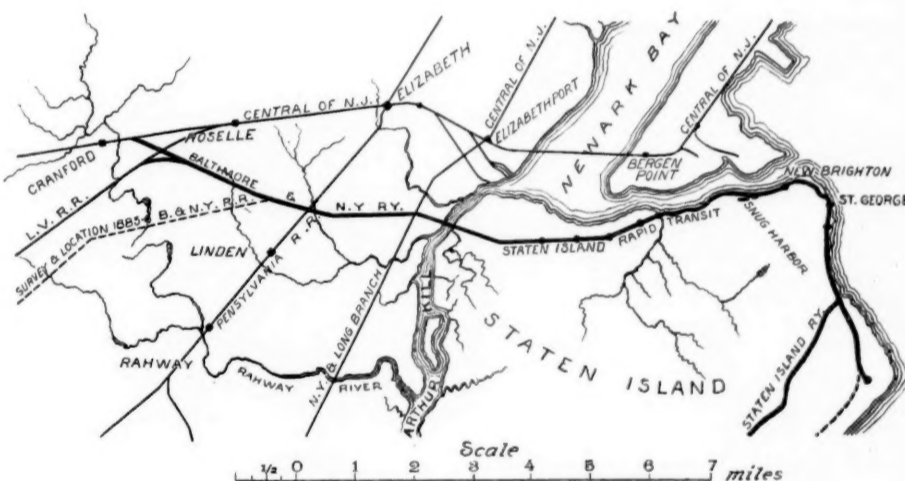
East Approach to Arthur Kill Bridge, Staten Island—Profile and Alignment.



West End of Trestle.



Junction of Framed and Pile Trestle.



THE BALTIMORE & OHIO LINE TO STATEN ISLAND.

and hands them to the porter, who pastes them on the baggage. The clerk then cuts off the receipt and hands it to the passenger with his ticket. Then he has only to cut off the train baggage-master's coupon and he will be through with one passenger. In doing this he has written at least twelve entries, scattered over a strip of paper about 2 ft. long. If there was overweight, which is often the case where the allowance is but 55 lbs., he must make four more entries; if the station to which the baggage is consigned is not one with which there is very frequent communication, he must write the name of it five times at least, and he may have to write that of an intermediate station (via) as often. We will leave out the possible entries in connection with declaration of values, of which there may be six, as relating rather to what we would call express than baggage shipments.

It is doubtless because of this much writing that the German railroad regulations provide that unless you present your baggage 15 minutes before train time, you cannot demand that it be forwarded by that train. This regulation, however, it is impossible to enforce. Not even the Germans are patient enough to spend so large a part of their time waiting in the stations, and the baggage masters find themselves forced to a very uncomfortable degree of activity in order to get through with their work, and trains are not seldom delayed in consequence.

Commenting on this, the station assistant who writes to the *German Journal* says: "The present arrangement, in fact, as time has shown, especially where much baggage is forwarded, has many imperfections, which together are

great obstacles to the rapid forwarding of baggage"—which is putting the case very mildly. He says that the labor is increased because the clerk must use alternately pen, scissors and blue pencil, losing time in changing his tools. He proposes a substitute, which consists, substantially in making three manifold copies of the baggage receipt, somewhat modified in form, one of which would serve for the station record, like the present stub, another for the train baggage master, and the third for the passenger. The labels would remain as at present.

#### Craig's Heating and Circulating Apparatus for Steam Boilers.

It is well known by engineers that boilers are generally injured by raising steam from cold water, on account of the unequal expansion produced when fires are lighted; and that after steam is raised, the circulation is so sluggish in many types of boilers, as not only to impair their steaming qualities, but also to occasion leaks and cracks, by reason of the uneven temperature of the metal, which has comparatively cold water in some portions, and is continually receiving cold feed-water. Mr. William Craig's circulating apparatus, here illustrated, is designed to heat and equalize the temperature of the water in a boiler before the fire is lighted; and to both heat the incoming feed after steam is raised, and make the water in the boiler circulate from the lower to the upper part.

Fig. 1 shows the apparatus attached to a locomotive boiler, and is an accurate representation of the device as connected to two locomotives of the Pennsylvania Railroad Company.

An explanation of the mode of operating the attachment will make its principle plain. Suppose that the boiler is empty and steam is to be raised. A steam-pipe or hose from another boiler is attached at the connection shown, to operate the injector and force water into the boiler. When sufficient water has been introduced to show in the glass-gauge or first gauge-cock, the water-supply is closed, but the steam is permitted to flow through the injector, further heating the water and also causing it to circulate from the leg through the "suction-pipe" shown in fig. 1, and "delivery-pipe," into the upper part of the boiler, steam being admitted until the pressure in the two boilers is equal, after which the fire is started. The circulation of water from the leg into the upper part of the boiler, is caused by the flow of steam or water through the nozzle of the "circulator," a section of which is shown in fig. 2. The circulator is, in effect, an ejector, and the flow of a liquid or gas through the nozzle induces a current of water through the "suction-pipe" shown in fig. 1. When the boiler is supplying steam, the operation of the injector to introduce feed induces a current through the suction-pipe, both heating the incoming feed and causing a rapid circulation throughout the boiler, thus preventing the formation of strata of cold water which exist in so many boilers, decreasing their steaming qualities and durability.

The application of the apparatus to marine boilers is essentially the same, except that when the boilers are fed by pumps only an auxiliary connection or injector is fitted, to be used before fires are lighted. After steam is raised, the introduction of feed by a pump induces a current from the bottom of the boiler, as already described.

This apparatus has been thoroughly tested by a board of naval engineers, who report that "It is the best apparatus of its type which we are acquainted with," and furnish the following table of results:

STARTED THE INJECTOR WITH WATER IN THE BOILER AT A TEMPERATURE OF 64 DEGREES FAHR., AT THE BOTTOM, AND 63 DEGREES AT THE TOP, OR NEAR THE WATER LINE.

Time.	Temp. feed water.	Steam pressure.	No. 1. Bottom of boiler.	No. 2. Bottom of boiler.	No. 3. In-jector dis-charge pipe.	No. 4. Top, or 9 in. above water line.
A. M.	Degrees.	Pounds.	Degrees.	Degrees.	Degrees.	Degrees.
8.....	64	.....	64	64	64	63
9.....	64	.....	75	88	144	120
10.....	64	.....	142	143	212	163
11.....	64	10	162	166	268	215
12.....	64	40	236	240	278	278
P. M.						
1.....	64	40	280	283	250	283
2.....	64	45	280	280	258	278
3.....	64	41	278	279	256	278
4.....	64	43	279	280	270	280

The Craig circulating and heating attachment has been applied to a number of marine boilers, and some particulars of its performance may be of interest. About three years ago a circulator was connected to a boiler, of the Scotch type, on one of the tugs belonging to the Pennsylvania Railroad Co. It had previously been very difficult to generate sufficient steam in this boiler, and it was necessary to caulk leaky seams in the bottom of the shell every few days. After the change there was no more difficulty in keeping up the desired steam pressure, and there have been no more leaky seams. The circulator has since been applied to most of the tugs and ferryboats operated by the Pennsylvania Railroad Co. with satisfactory results, it being found, in the case of the ferryboats, that the circulation prevents the formation of scale, which had been a serious trouble before the use of the apparatus. The experience of engineers on several steamships using the Craig circulator is similar to the foregoing, it being found that the apparatus improves the steaming qualities and durability of boilers and diminishes the coal consumption.

As already mentioned, the circulator has been applied to two locomotives of the Pennsylvania Railroad Co., and it is stated that their action is quite satisfactory, the circulation being evidently improved; but that further experiment will be required to determine exactly how valuable the attachment may be. This is a matter in which master mechanics and railroad officers generally must be interested. Anything which promises to improve the efficiency and durability of a locomotive boiler is certainly worthy of investigation. An inspection of the sketch will show that the circulator can easily be attached. The inventor furnishes all the fittings, or simply the part shown in fig. 2, as may be desired, everything but the circulator being ordinary pipe-fitting which can be done in any general shop.

Further information in regard to this device may be obtained from Mr. William Craig, 161 Broadway, N. Y.

#### A Steam Logger.

The illustration of this motor which is given in this issue is from a photograph taken when it was in successful operation, actually hauling 25,065 ft. of timber. The first practical use made of it was in the fall and winter of 1887 and 1888, at the camps of Shields & Wilson at the head of the Michigami River. There are four driving wheels on one axle. Each wheel has a tread of 12 in. and is about 48 in. in diameter. On it are 17 teeth. The axle is 6 in. diameter and 7 ft. long. The four drivers and the axle weigh together about four tons. The wheels are driven from the engine by a steel chain belt. The wheels are partly inclosed in a box, below which are rubber curtains reaching to the ground. The exhaust steam is admitted to the interior of the drivers, heating them and softening the snow. The result is that the snow does not stick to the drivers, but is put in a condition to be

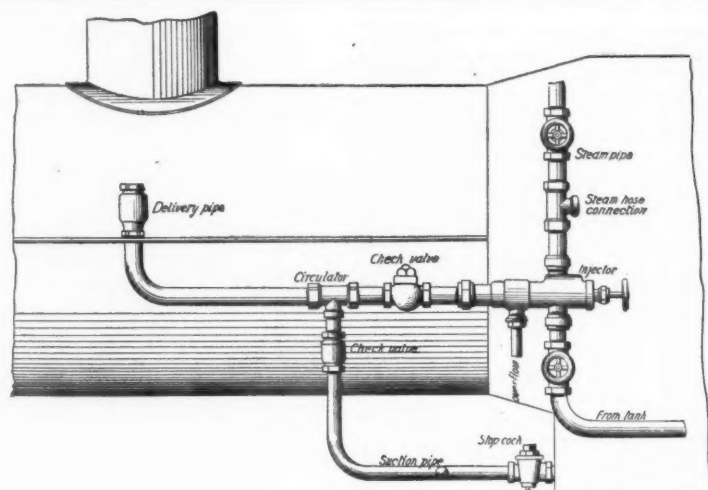


Fig. 1.

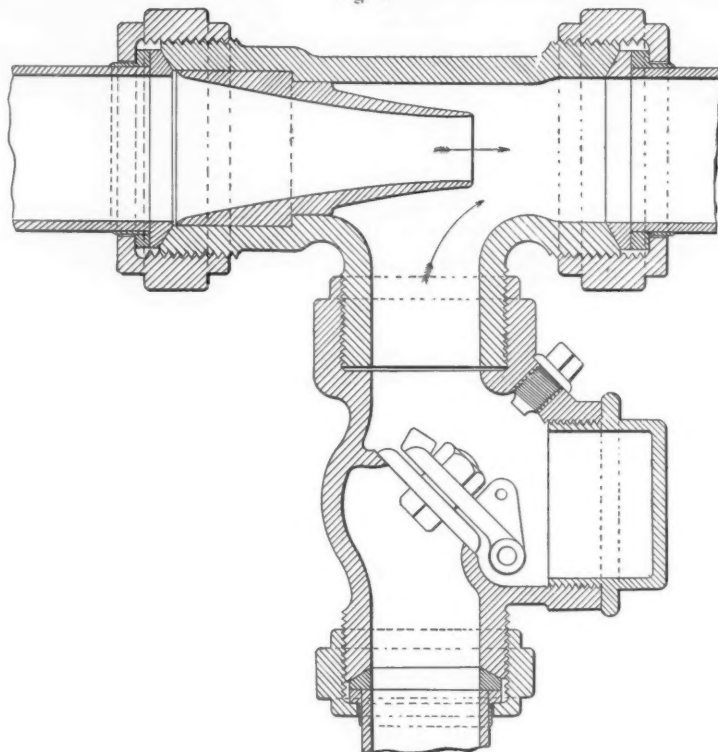


Fig. 2.

CRAIG'S CIRCULATOR.

well compacted by the weight of the machine. After a few trips the snow becomes very solid, and in cold weather it is converted into ice. The engine is a double vertical engine with 10 in. x 12 in. cylinders. The boiler is 68 in. diam. by 90 in. high, with 320 two-inch submerged flues. The whole machine weighs about 12 tons. A steering wheel placed in front guides the forward runners of the motor. A traction increasing contrivance is provided by which part of the weight of the engine and boiler can be transferred from the runners to the driving wheels. In the last two winters this logger has shown its capacity to break out and maintain its own road through deep snow. It is thought that under many conditions logging by this machine will be cheaper than by logging railroads or by horses.

The first outlay in plant is so great in building a logging railroad that the price per 1,000 ft. for hauling logs by rail exceeds the cost with horses, unless the body of timber is thick and in quantity at least 100 million ft. From statistics of the operations of 73 logging railroads the average length of which was eight miles, the cost of hauling per 1,000 ft. per mile was 20 cents. This was exclusive of depreciation of rolling stock and of the loss on the investment when the road bed and track became no longer available. These logging roads cost \$4,000 per mile for road bed and track. In western Wisconsin, where the country is comparatively level and the haul short, the cost of hauling with horses is from 24 to 30 cents per mile per 1,000 ft. In the upper peninsula of Michigan it runs from 45 to 60 cents. This, it is said, does not include the cost of summering the stock. From work already done with this steam logger it is estimated that the cost of hauling with it is very much below that of the other methods. This machine is built by the Glover & Chandler Steam Logger Co., of Chicago.

#### Gravity Yards in France.

A recent issue of the *Bulletin* of the International Commission of the Railroad Congress contains a very long article by M. René Picard, Traffic Manager (Chef d'Exploitation) of the Paris, Lyons & Mediterranean railroad, on the gravity

yards of that road. We have condensed most of the information given into what follows:

There are two principal systems for employing gravity in sorting cars. That shown by fig. 1 consists in having two

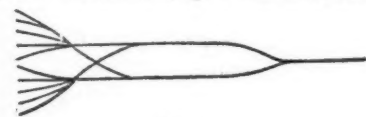


Fig. 1.

main distributing tracks, from which the cars are distributed to the various branches, on an incline of about 1 in 100. The distributing tracks are connected by crossings at the end, towards the yard tracks, and by a tail switch at the other end. A yard engine brings a train, or part of a train, on to one of the distributing tracks, returning for a second train or section over the other whilst the cars of the first are being switched off. The second section is left on the second distributing track, the engine running out over the first, which has meanwhile been cleared. This system is suitable for a

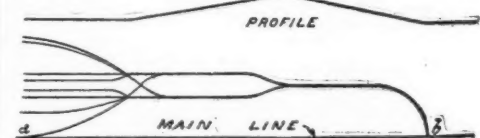


Fig. 2.

small yard where quite a number of cars are handled. An objection to this system is that the cars acquire very different velocities starting from different points on the incline.

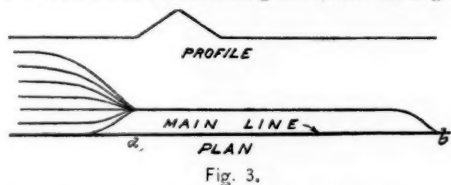
With a slight modification this system can be used for yards of less importance where there would not be work enough for a yard engine. In this case one of the distributing tracks is prolonged 300 metres, on a counter incline, and joined to the main track. See fig. 2. The train either enters directly at a or is pushed on at b, the engine returning by b.

The second system needs only a single distributing track, fig. 3. The latter is level, except for a distance of about 100



THE GLOVER &amp; CHANDLER STEAM LOGGER.

metres at the end next the yard tracks, where there is a rise (*dos d'âne*), an incline and counter incline of 1 in 100. The train is received on the distributing track; after marking the



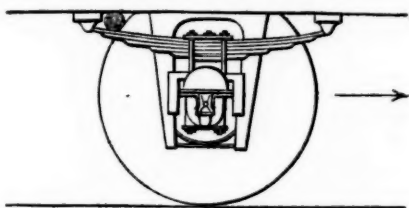
wagons the safety chains are unhooked at the points where the train is to be cut. When this preparatory operation is completed the train is pushed about as fast as a man walks. An employé stationed near the summit uncouples the cars with a pole as fast as they pass before him. The cars thus uncoupled descend the incline with increasing speed. The yardmaster calls out to the switchmen the number of the track for which the cars are destined, and employés distributed in sufficient numbers throughout the yard receive them and arrest them at the proper moment. This system is likewise applicable to yards, the importance of which does not justify the use of a shifter. It allows the same velocity to be given to all the cars, and almost any ordinary yard can be transformed to one on this system with slight expense.

Regarding this last system, fuller details as to the arrangement and operation are given as follows: It consists in having a distributing track of a length of at least 50 metres more than the longest train to be received, and in profile fulfilling the sole condition that the trains shall not encounter a greater resistance than is encountered on the main line; this condition permitting the establishment of these distributing tracks or the transforming of existing ones at a small cost. Toward the end of the distributing track next the yard tracks is a rise, varying from 20 to 30 in., connected by inclines of about 1 in 80 or 1 in 100. Moreover the neighborhood of the switches, instead of being level like the rest of the yard, is inclined toward the yard, about 1 in 250. At the foot of this incline the tracks are horizontal. The height of the summit should be great enough to allow the cars to attain sufficient velocity to carry them to the points where they are to arrive. This velocity should also be such that when they arrive at the foot of the incline they are far enough apart to avoid all danger of collision or interference and to allow the convenient manipulation of the switches. The incline of 1 in 250 at the switches is solely to counterbalance the resistance due to the curves, switches and crossings. It is stated that this general disposition is to be observed, but that it can and should be varied somewhat according to circumstances, as for example if the prevailing winds blow from a direction opposite to that the cars take the height of the summit is increased, or if the tracks are so arranged as to offer much resistance the inclination near the switches would be greater than 1 in 250.

The trains received upon the distributing track, the safety chains are disconnected where the train is to be cut, under the direction of the yard-master. On the front end of each car or on the front end of the first car of a section is marked with chalk the number of the track on which it is to be run, and on the rear end the number of the track on which the following car or section is to be switched. When these preliminary operations, which occupy ten or twelve minutes for a train of 60 cars, are completed, the engine begins to push the train toward the yard.

A man stationed near the summit, a little below, on the side away from the yard, with a pole uncouples the cars where marked with the chalk as they pass before him. There is generally little resistance to disconnecting the couplings, as they are slack since the train is being pushed up the incline. The car or cars thus uncoupled separate rapidly after being pushed over the summit. They arrive at the switches bearing on their front end the inscription informing the employés upon which track they are to be turned. As the cars pass the men can read on the rear end the number of the switch which is to be opened for the following car, and when this car or section arrives the switches are already set; and if there has been an error in reading, the number appearing a second time there is generally time to rectify it. In the night the number of the track is called out to the switch-tenders by the yard-master. This is not faultless, for confusion is easier, but in general the operations at night are carried on slower. In the day-time the speed is such that the train traverses the 500 metre distributing track in from five to eight minutes at the most (about three miles an hour).

Employés distributed in the yard meet the cars, setting the brakes and accompanying them to the point where they are to be stopped, or at least leaving them at a point where the speed is so reduced that the cars will not injure those already on the track. If the cars are not provided with brakes, or if it is impossible to operate them, or if the brake is of a kind that cannot be operated except by mounting the car (for it seems that the employés do not do this), the switchman uses a strong bar of soft wood which he slips into the opening between the sill, the spring and the wheel. See fig.

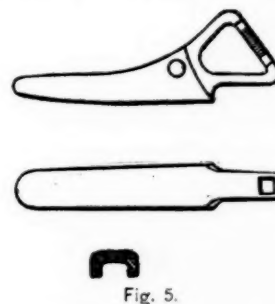


4. In this position the bearing plate of the spring serving as a fulcrum, it suffices to hold back on the end of the bar, to force the other end against the circumference of the wheel and to cause it to act as a brake. The men who perform this operation are called staff-men (*bâtonnistes*), and M. Picard states that, as a matter of prudence, all cars containing powder, munitions of war, dynamite, explosives or inflammables and all cattle cars are always accompanied by a *bâtonniste*.

With this system the number of *bâtonnistes* need not be as large as in yards of the first type, entirely on an incline where the car must be accompanied from the point where it is detached from the train to the point where it is stopped. The reason is easily understood. In yards of the first type the cars acquire very different velocities. The last cars of a section of twenty-five come from a point considerably higher than the first, and if left to themselves would acquire a velocity in the first 100 metres such that it could not be reduced. It is, therefore, necessary that the *bâtonnistes* ascend to the point where the cars are detached, and that they traverse greater distances in proportion as the breaking up of the train advances. It is thus necessary to have a greater num-

ber of employés to avoid lengthening the operation beyond measure.

It is not so with the *dos d'âne* system. All the cars have sensibly the same velocity when they reach the foot of the incline. It results theoretically, therefore, that if the height of the *dos d'âne* has been properly chosen, if the inclination at the switches is right, if the branches are laid out so that one track does not offer much greater resistance than another, and supposing the yard is empty at the time the train arrives, all the cars, if left to themselves, would stop at the extreme points which they are to attain and arrange themselves on the parallel tracks almost opposite one another.



There would be a slight difference actually, due to the difference in the weight, style, and conditions of lubrication of the cars. As a yard is never empty and the various tracks are occupied very unequally, the *bâtonnistes* can never be dispensed with, but their intervention is confined to checking the speed of the car that it may not forcibly collide with and injure the cars already on the track. The *bâtonniste* is therefore not obliged to accompany the cars from the moment they are detached until they are stopped; he contents himself with going to meet them, moderates the speed during some instants by means of a brake or his stick, and abandons them when he perceives, guided by practice, that the car will stop at the desired point, and returns to meet another. With proper conditions and expert *bâtonnistes* few employés are required, and the work is done rapidly and economically.

Latterly the stick has been largely replaced by the shoe-brake (*sabot-frein*). This is made of steel and is shown in fig. 5. By its use cars descending from the summit of the *dos d'âne* can be arrested with certainty and gradually in a distance of from 5 to 10 metres, according to their velocity. By placing one of these on one of the rails 10 metres from the buffers of the last car on the track one can be certain that the two cars will not be injured by collision. As soon as the car is stopped, the wheel which has mounted on the shoe rolls down and releases the instrument. These shoes are placed between the tracks on the ballast, about 15 or 20 metres apart. Their use permits steeper inclines and greater speed in switching, and the men are not then obliged to run in the midst of switches and crossings while bearing down on a brake or pulling a *bâton*, a dangerous procedure when the velocity is considerable.

As to the relative economy of the gravity system and the one in use before its adoption, M. Picard gives some figures. In 1885, at Avignon, the last year before the establishment of the gravity system, the number of cars handled was 177,244, at a cost of about 7.72 cents each; in 1888 the cost was 6.16 cents, a saving of about 1.56 cents each, and it certain-

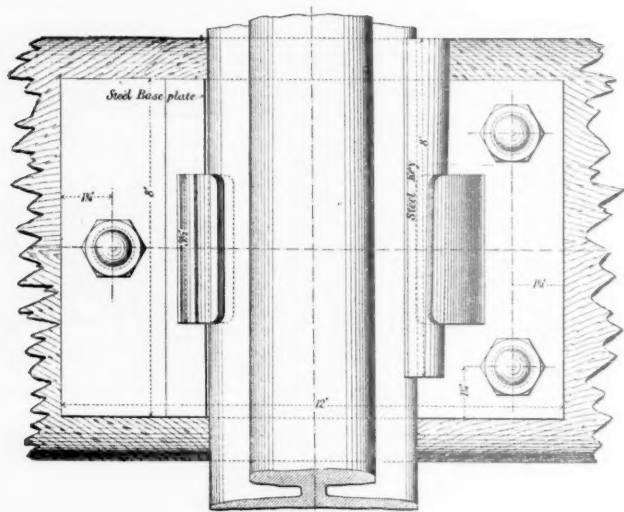


Fig. 3.

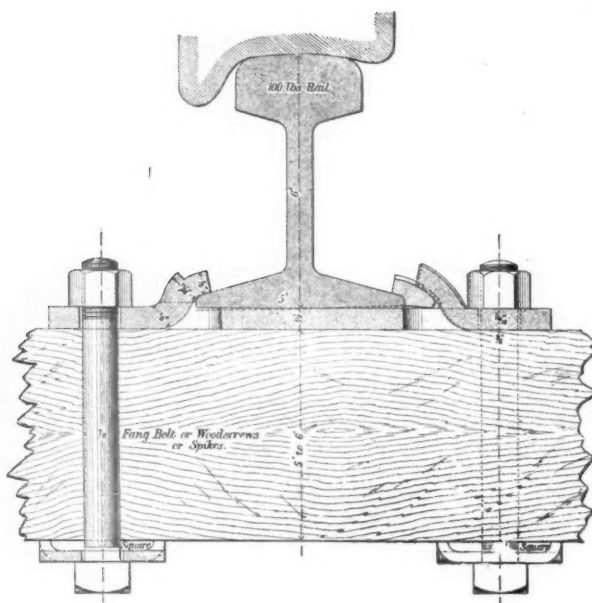


Fig. 2.

ly would have been greater had there not been a falling off in the number of cars handled. At Luneltrige, in 1886, the last year preceding the change, the number of cars handled was 209,270, at a cost of about 6.6 cents each; in 1888 the cost was about 4.72 cents, a saving of about 1.88 cents per car. In these yards before the adoption of gravity, shifting engines were employed.

#### A New Goliath Rail, with Steel Base Plate.

BY C. P. SANDBERG, C. E.

There may not seem at present to be any urgent call for a new Goliath rail, inasmuch as the first type was constructed only three years ago, and therefore our experience of it has, as yet, been comparatively small. During that period, however, several important facts have been brought to light with respect to rail sections generally, which also affect the Goliath, and as this is a costly rail it had better be made right at once. These facts are:

*First.*—That the big rail head, owing to the fast rolling in the modern mills, does not seem to wear well, inasmuch as the hardness physically is only in the surface and not in the interior of the rail head. But we shall not be able to make rails chemically hard with .50 to .60 per cent. carbon as is now used in American mills before we, in Europe, adopt the American mode of curving the rail while hot, so as not to spoil the strength of the rail by cold straightening presses and gag marks on the flange which might cause fractures and accidents. It will anyhow be preferable to have a wider rail head rather than a thicker one. The great value of this modification will be seen not only in the longer duration of the rail, but also in the increased life of the tire, which would not require to be turned if the rail head were as wide as the bearing surface or nearly so. It would also add to the traction power of the engine by offering a greater surface to the driving wheels on the rail; in fact the traction power of an engine on the wider rail head would be greater than that of an engine of equal weight on the narrower one.

*Second.*—It would offer a better bearing for the fish joint without sloping the sides of the rail-head, as has been done so largely in America, and has now been abandoned by reason of the side friction to the tire flange.

*Third.*—The crushing load of the driving wheels would not exceed the limits of elasticity of the steel in the wider rail head.

These seem to be facts of very great importance, and well worthy of attention. The new Goliath rail section of 1889 has therefore been designed with a head 3 in. wide instead of 2 1/2 in. and 1 1/4 in. deep instead of 1 1/2 in., thus giving a thinner head of greater wearing surface in width instead of depth, and giving 1 in. bearing of rail-head against the fish instead of 3/4 in.

The distribution of weight in the new Goliath as compared with the old is as follows:

	1886.	1889.
Head.....	43.5	45.5
Web.....	23.9	22
Flange.....	32.6	32.5
	100.0	100.0

Regarding the top radius, in respect of which there has been so much discussion in America with the view of not overloading the limit of elasticity, it has been taken to be 8 in. instead of 10 in. It is thus made rather more round, for the reason that the tires on old lines, where such a Goliath rail would be used, are certainly not flat, but more or less worn hollow. By an increase of width of 3/4 in. or 1/2 in. in the old rail head the tire would, in curves, be brought to bear on the outside part and thus lessen the acting depth of the tire flange by as much as it is worn hollow, so as to cause some risk of running off, and this would be the greater the more the rail head is flat and the tire worn hollow. Therefore the 8 in. radius of rail top, which is supposed to also represent the radius of the existing wearing surface of the tire, has more chance of safety by keeping the tire on the rail, with the application of a Goliath rail of 3 in. wide exchanged

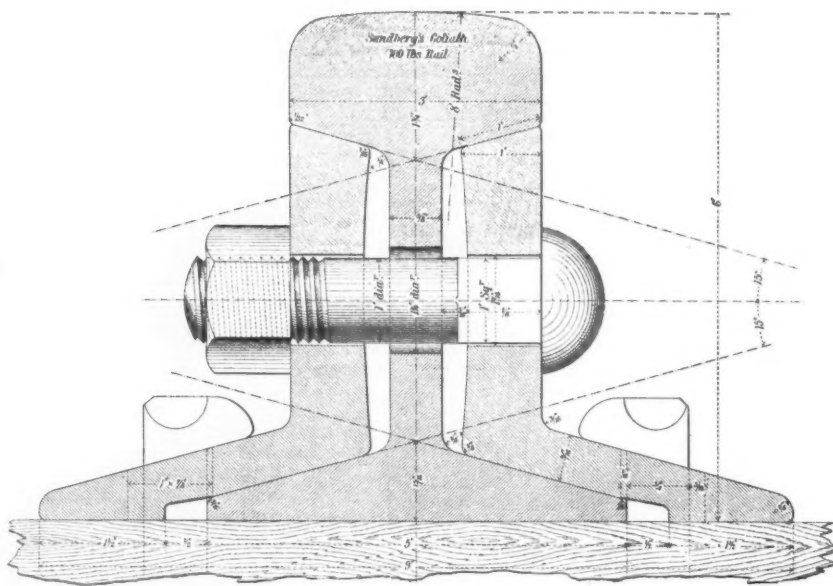


Fig. 1.

SANDBERG'S REVISED "GOLIATH" RAIL, WITH STEEL BASE PLATE.

on a road where 2 1/2 in. rails have been used. As these new Goliath rails will offer a wider bearing for the tire, it will practically come to the same thing as if the rail head were flat and narrower, namely the prevention of overloading the limit of elasticity, particularly as the wider surface in the skin will be harder through colder rolling than in the thick, narrow head.

The 1/2 in. corner radius of rail head as adopted in America would not be applicable in Europe until the bogie system is generally adopted here as there, therefore the 1/2-in. radius is adhered to. The vertical side is maintained as a medium between the American rail, sloping inside, and the Russian and German, sloping outside. The low-corner radius of rail-head may be as sharp as it can be rolled, say 1/2 in. The bearing of the fish, 1 in., against the rail head should be perfectly straight and so should the fish also be, as if planed in a planing machine. This explains the changes introduced into the rail head.

Now as to the flange of the new Goliath. The weak point of the road with flange rail generally, as compared with the bull head rail in chairs, is the insufficient width of the base and the weak mode of fixing the same to wooden sleepers. Five and a half inches width of rail base, which was the width in the Goliath design of 1886, is not sufficient for pine sleepers of loose texture as compared with the 12 in. to 15 in., which is what the cast iron chair has to offer for the bull-head rail section. It would, therefore, be better to give up the plan of laying the rail flange direct on the sleeper, and adopt a steel plate of sufficient surface, or equal to that of the cast-iron chair of nearly 100 sq in., say 12 x 8 1/2 in. thickness, so as not to bend it, and fix the same to the sleeper with 3 fang bolts, wood screws or spikes, applying clips and steel keys for fixing the rail to the base plate (see figs. 2 and 3) thus enabling the rail to be made of harder steel, and affording a firm fixing of the rail to the sleeper; and yet by knocking out the steel keys it offers a quick means of changing both rail and sleeper when one of them becomes defective. The insufficient mode of fixing the flange rail direct to the wooden sleeper by spikes or wood screws would thus be done away with, and a longer duration of the sleeper would be insured. It should be observed that

the rail flange has on both sides a bearing of the whole width of base plate of 8 in., as against the old method against a spike or a wood screw, and that the widening of gauge in curves could be arranged by using steel keys of different sizes as in metal sleepers, of which several hundred thousand tons have now been laid in different countries with satisfactory results. Should the tilt of the rail of 1 in 20 be needed, this could be got by rolling the base plate of different thicknesses for the width of rail base (see dotted line in drawing).

The fixing of the base plate to the sleeper is effected by means of spikes, wood screws or fang bolts, thus giving the sleeper of loose wood a bearing surface of more than double that given when the rail is laid direct, which will naturally double the life of the sleeper. The extra cost of additional weight of 13 lbs. to the base plate would well be covered thereby, and the total expense of the Goliath railroad would still be less than that of the English road with bull-headed rails and cast-iron chairs. If this plate is taken at £3 per ton it would still be of less cost than the cast-iron chair, which weighs 40 to 50 lbs. and costs £2 10s. to £3 per ton. By this means it might be possible to obtain an equally good and safe permanent way by using flange rails as with the English bull-head type of rail and at a somewhat less cost. But, as is now only too often the case on the Continent, to employ half the weights of metal in the flange rail as in the bull head section (with chair included), and yet to demand equal strength, is to ask too much of the flange rail section.

An interesting book called "Express Trains, English and Foreign," by Foxwell & Farrier, just published, classes as "English express trains" all trains run at 40 miles an hour and over, including stops, and "Continental express trains" those running at 29 miles an hour or over. Statistics show that in England only half the number of passengers per cent. are killed as compared with the Continent. These facts speak volumes for the superiority of the English railroads, and the want of improvements in the Continental roads. In the second edition of this valuable work it would be of interest if the disproportion between weights of rail and weight of engines were added in a column for each express, so as to show where an increase of rail weights in the direction of the Goliath is mostly wanted. As it would be useless

to try and introduce the English type of road in those countries where flange rails are already adopted, the only way to obtain an equally safe and strong road for heavy traffic as on the English lines seems to be to strengthen those by the adoption of the Goliath rail with steel base plates, but to let every one keep to his system of rail. And as fortunately the price of steel has become so low it would now become an economic advantage for saving the cost of maintenance, and the public safety, with increased speed would be an additional advantage. To take a striking illustration, one need only compare the rail weight and the rolling stock with guns and armor plates. The guns have been gradually increased to the weight of 100 tons, and the armor plates similarly increased in thickness in equal proportion at the same time say up to 18 in. The rolling stock has doubled in weight and the speed been increased, but the rail has been left the same, especially the flange rail on the continent. The rail, too, has something to do with war and defense, for just as the armor plate must withstand the battering of the guns, so must the rail withstand the battering of the rolling stock, and be increased in proportion to the weight of the latter and at the same time. But this is precisely what has not been done, for while the locomotive department has increased the rolling stock as a matter of necessity to take the increased traffic, the permanent way department seems to have had no power over the directors, and so the disproportion between the permanent way and the rolling stock has come to be an established fact on many continental roads with heavy traffic.

The weak rail may, by stopping and patching, keep the road open under ordinary conditions; but in time of war, for instance, where the traffic is doubled or even trebled, where would the weak rail be? And what could be done to it when there is no time for patching and for repairs? The strong rail has, in truth, a great deal to do with the defense of a country, for the army which can with provisions and ammunition reach the battlefield first stands the best chance. Experience has sufficiently proved this already in 1870. Thus, the Goliath rail is really a means of defense, at least in Europe. Besides, enough has been said to prove its *raison d'être* even in time of peace. The recent experience regarding change of rail section, as stated above, will, it is hoped, be considered to justify the appearance of this second edition of Goliath rail section; and as the design of 1886, after much persuasion, broke the ice by its adoption on the Belgian State Railways, it may be hoped that that of 1889 will further the general adoption of this rail more rapidly, not only by offering a better section and a stronger joint, but also by stronger and firmer fixing to the wood sleepers and the longer duration of the same by the use of steel base plates (as per drawing).

At the Paris Exhibition there is a sufficient display of Goliath engines and carriages, but very little is exhibited to illustrate the proportionate strengthening of the road; in fact the almost single exhibit of this kind is a series of rail models called "Goliath rails," in the Machinery Hall (class 16 Railway Material), showing the history of the Goliath rail, first the drawing of Sandberg's Goliath of 1886, then the model of the same 1887, afterward the Belgian State Railway adoption of the Goliath, as made by the Société Cockerill of Seraing, now 15,000 tons, and lastly drawings and models of Sandberg's Goliath of 1889, with the addition of the large steel base plate with clips and steel keys for fixing the rail, and fang bolts, wood screws or spikes for fixing it to the wood sleepers.

It may naturally happen that in its adoption modifications may be continually introduced by different engineers, caused from individual experience and local conditions, such as climate, etc. This, however, does not affect the principle now proposed to improve the Continental roads, which is free for adoption by any one, and it may be added that the mode suggested is based on long experience, and at least free from private interests of any kind whatever.

#### Riveted Joints.

The *Locomotive* for July, 1889, contains a contribution on longitudinal riveted joints of steam boiler shells, by Mr. John H. Cooper. A synopsis of this article may be of interest.

In riveted joints it is desirable to make the strength of the plates and that of the rivets equal. The following rules show how to find the proper proportions:

When rivet holes are punched, they are usually somewhat larger than the normal diameter of the rivets; and in view of the possible deterioration of the plate due to the action of the punch, it is recommended, in calculating riveted joints, to assume that the diameter of the punched hole is  $\frac{3}{8}$  in. greater than the diameter of the rivets. It will be understood, in the rules which follow, that when the diameter or area of rivet is mentioned the normal trade diameter or area is to be used; and that the diameter or area of the rivet hole is to be increased as noted above.

In the case of a given joint, the percentage of punched plate to the solid plate is

$$\frac{p-d}{p},$$

or the distance between the centres of adjacent rivets (the pitch of rivets) in inches, diminished by the diameter of the rivet hole in inches, and divided by the pitch of rivets.

The percentage of rivet section to the solid plate is

$$\frac{L \times n}{p \times t},$$

or the area of a rivet multiplied by the number of rows of rivets and divided by the pitch of rivets multiplied by the thickness of plate—all dimensions in inches.

If the joint is properly proportioned, the above percentages

will be equal to each other. But if this is not the case, the least of the two percentages is to be used in the next rule. The safe working pressure for a cylindrical boiler shell, having a factor of safety of 5, is:

$$\frac{t \times \text{percentage} \times T}{5R},$$

or the continued product of the thickness of the plate, the least percentage (either that of punched plate or rivet section, as the case may be) and the tensile strength of the plate, divided by five times the radius of the boiler shell, dimensions being expressed in inches and tensile strength in pounds per square inch of cross-section. In proportioning a riveted joint so that the strength of the plate equals that of rivets, there are several cases to be considered. It is supposed that the thickness of plate and the size of rivets are known. For iron plates and iron rivets, the proper pitch is:

$$\frac{a}{t} + d, \text{ for single riveted joints, and } \frac{n \cdot a}{t} + d, \text{ for multi-}$$

ple riveted joints, or the area of the rivet hole divided by the thickness of the plate and increased by the diameter of the rivet, for single riveted joints, all dimensions being in inches; while for multiple riveted joints the area of the rivet hole is to be multiplied by the number of rows of rivets. For steel plates and steel rivets, the proper pitch is found by taking .821 of the areas in the foregoing expressions; or

$$\frac{0.821 \times a}{t} + d, \text{ for single riveted joints,}$$

$$\frac{0.821 \times n \times a}{t} + d, \text{ for multiple riveted joints.}$$

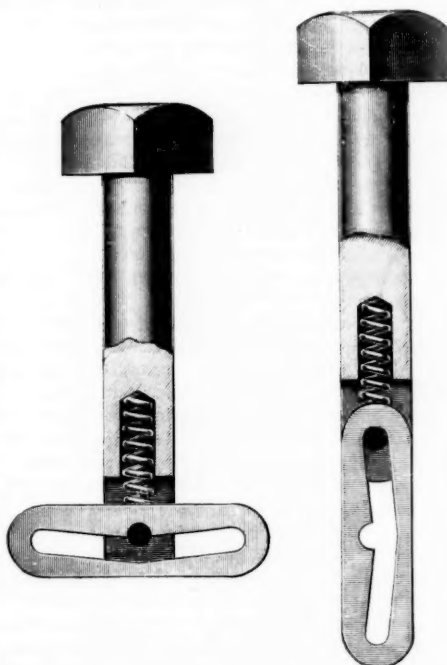
For steel plates with iron rivets, the proper pitch is found by taking  $\frac{615}{1000}$  of the areas in the formulas for iron plates with iron rivets, or

$$\frac{0.615 \times a}{t} + d, \text{ for single riveted joints,}$$

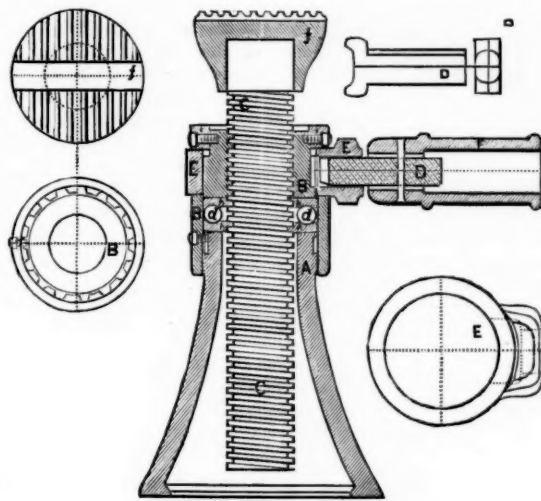
$$\frac{0.615 \times n \times a}{t} + d, \text{ for multiple riveted joints.}$$

#### Wright's Bolt Fastener.

This device is intended to take the place of a cotter or split key. It consists, as is clearly shown in the cuts, of a slotted



key which can be turned to a position in line with the bolt, or across it, and which is itself held from slipping out of place by the spiral spring. This fastener was patented in 1885, but has not until recently been pushed in the market,



THE ROBIE SCREW JACK.

and is little known. It is made by the Wright Manufacturing Co., of Philadelphia, and the agency has been taken by Messrs. Pedrick & Ayer, from whom any information may be had.

#### The Robie Screw Jack.

This jack is shown in a sectional view, in which A is the pedestal, C the power screw and B a nut by which the screw is operated. In the top of the pedestal a circular groove d is turned to receive a series of balls on which the nut B turns. Another groove in the pedestal receives set screws, which prevent the nut falling off when the jack is overturned. The nut is operated either by a bar or by a ratchet movement. The upper end of the screw has a removable head f, giving a large bearing surface.

This jack was examined by a commission of United States naval engineers, Dec. 29, 1886, at the New York Navy Yard. After a careful examination it was recommended for purchase and use in the Navy Department. It is claimed for these jacks that they take the place of the hydraulic jack, and at less cost.

The Robie jacks are covered by patents, which are controlled by Messrs. Riehle Brothers, Philadelphia, who are the sole manufacturers. Descriptive circulars and prices will be furnished upon application.

#### TECHNICAL.

##### Corrugated Locomotive Boiler Furnaces.

Bearing upon the question of using corrugated furnaces in locomotive boilers, Mr. V. Duszakiewicz, Master Mechanic of the Warsaw, Vienna & Bromberg Railroad, contributes to *Glaser's Annalen* some interesting historical notes.

He directs attention, among other things, to the fact that the first one to overcome the necessity of staying, in great part at least, the fire box surfaces in locomotive boilers was Mr. Maey, of Zurich, at one time Master Mechanic of the North Eastern Railroad of Switzerland. In the year 1867 Mr. Maey used a fire box with a semi-cylindrical crown sheet which, as well as the vertical side walls, was made of corrugated copper sheets. Particulars of this are given in the *Organ für die Fortschritte des Eisenbahnwesens*, 1872. In 1875 a boiler was designed by Kaselowsky, in which the vertical side walls of the fire box were abandoned and the semi-cylindrical furnace of Maey developed so as to really embrace from  $\frac{3}{4}$  to  $\frac{5}{8}$  of a circumference. In this form no stay bolts whatever were used. In 1884 the Strong locomotive boiler was brought forward prominently, but to this we need not refer particularly here, as it is sufficiently known to our readers. In 1886 *Dingler's Polytechnisches Journal* published a design by Crampton, in which the boiler was formed of two superimposed partial cylinders, of which the lower one was fitted with a corrugated furnace flue. Mr. Duszakiewicz further refers to a corrugated furnace design of his own, noticed in the *Zeitung des Vereins Deutscher Eisenbahn-Verwaltungen*, Oct. 5, 1887. Copper was in this case again used. In view of the attention given at the present time to this general form of furnace design for locomotive boilers, these notes may not be without interest.

##### Grates on Swedish Locomotives.

In describing the new fast passenger locomotives of the Swedish state railroads, the *Revue Générale des Chemins de fer* refers to the peculiar arrangement of their grates. These are made up of practically three parts. The front portion consists of short, narrow, horizontal bars, fitted so as to be capable of turning about one main rod arranged underneath. The rear section near the furnace door is a short horizontal grate, made up of fixed narrow bars. Between these two sections is the grate proper, arranged on an appreciable incline, and consisting of a series of short, stepped surfaces. Each step consists of closely spaced small bars, fitted to a square bar, running lengthwise. The grate complete has an abundance of air space, and was specially designed for the use of Swedish coal, in which the proportion of ash is very great, ranging up to 20 per cent. At present the engines are fired with a mixture of this coal and English coal, in equal parts, but it is intended to change the proportions to  $\frac{2}{3}$  Swedish and  $\frac{1}{3}$  English coal.

##### Copper Tubes by Electrolysis.

Foreign journals continue to commend the advantages of electrolytically deposited copper pipes as turned out by the Elmore process. Of the time required in this method of manufacture very little information has thus far been given. *L'Electricien* in a recent issue states that it took 170 hours to turn out a pipe 0.2 of an inch thick, but nothing is said of the diameter and length, the latter depending upon the length of the mandrel employed. It may not be amiss to repeat here that a claim of 50 per cent. increased strength over ordinary copper pipe is made for the newer product.



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#### EDITORIAL ANNOUNCEMENTS.

**Contributions.**—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

**Advertisements.**—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

Mr. James C. Clarke, President of the Mobile & Ohio, writes to the New York *Sun* suggesting a somewhat novel remedy for rate-cutting. He would have "the services of Presidents, Vice-Presidents, General Managers, General Superintendents, Traffic Managers, General Freight and Passenger Agents, etc., paid in the stock of the road they manage." He adds, "at its market value;" but this addition renders the whole proposition meaningless, and it is fair to presume that it was an inadvertence. He thinks that this would make such officials anxious, from a pecuniary point of view, to make their roads pay. We question whether such a plan could be carried out. In the first place, few railroad officers would like to be at the mercy of a board of directors, with the speculative element which it is so likely to contain. Mr. Clarke himself would not have the principle carried out where the stock of a road was below par; and this exception would pretty well destroy the force of the rule. Further, the plan might act as an incentive to evil instead of to good. It would not merely make them anxious to have their roads prosperous, but anxious to have them seem more prosperous than they really are. The effort to exaggerate profits does harm in every possible way. It produces a commercial inflation which must sooner or later be followed by a crisis. It tempts investors to put money in parallel railroads which are not needed. We believe that the harm in financial matters, if this tendency were increased, would outweigh any possible good results in traffic management or in operation.

Mr. Sandberg's revised "Goliath" rail section, which is shown on another page, is not only of interest intrinsically, but as illustrating the drift of the most intelligent opinion. The section conforms to the ideas now so widely held in this country and embodied in the report of the Committee of the American Society of Civil Engineers, that the head should be broader and thinner than it has generally been made; but for reasons which Mr. Sandberg sets forth, certain radii do not conform to those recommended by the Committee. This again illustrates the fact that while we now may expect a general recognition of certain principles in design, we are not yet in possession of enough knowledge to warrant much effort to get uniform standard sections. This is still further made evident by the fact that Mr. Sandberg actually increases in his revised section the relative amount of metal in the head of the rail, making it 45.5 per cent. If there is one thing that recent discussion has made evident, it is that the head must be made smaller rather than larger. The Michigan Central 80-lb. rail, which has been the pioneer in the movement for a smaller head, has 42.36 per cent. of the metal in the head. The standard sections lately proposed by Captain Hunt have from 40.33 to 41.95 per cent. The new sections of the Chicago, Burlington & Quincy, the Chicago & Northwestern and the Milwaukee, Lake Shore & Western, which were shown in our issue of April 12, have 40.68 per cent. and 41 per cent. of the metal in the head. Mr. Sandberg's new section with 45.5 per cent.

in the head is not to be considered as a step backward in this particular, or as indicating any abandonment of his former position that the head has been made relatively too large, for he explicitly says that the big head does not seem to wear well. The head still remains smaller than in common standards, as, for instance, the Pennsylvania 80-lb. with 47 per cent. in the head, and the Reading 90-lb. with 49 per cent. The base plate, which is illustrated in this issue, we showed April 5, but give it here to show the very efficient fastenings which Mr. Sandberg recommends. There are no patents on the plate, bolts, rail or on any combination of them.

#### Exact Language in Train Rules.

A correspondent on the Chicago, Burlington & Quincy propounds on another page a question concerning the principal flagging rule of the standard code. This rule, as all are aware, is one of the most important in the code, and the communication is worthy the attention of those interested. The first point to be noticed is Q.'s understanding of the word "extra." He seems to treat it all along as meaning "better than ordinary." We do not know what changes the C., B. & Q. has made in the standard code, in reprinting it for use on that road, but the official copy (rule 30) refers to the torpedo as a signal to be used "in addition to the regular signals," and the word "extra" is used only in connection with fuses (rule 31). But whatever it may refer to in the rules of the "Q.," our correspondent evidently interprets it to mean "very good," a construction which is familiar to most people. Following this meaning the clause could be paraphrased thus: "A signal which is better than visual signals, and is therefore to be depended upon in the more important emergencies instead of depending upon flags and lanterns." But, whether speaking of torpedoes or of fuses, the proper meaning is "additional," and the Time Convention committee evidently so meant it.

But the main point of our communication is that it is wrong to make a rule which will prevent the flagman placing torpedoes as often as he deems necessary during his journey from the train back to the proper point.

The answer to this criticism is to be found in the fact (1) that the Time Convention did not make rule 99a, and (2) in the impossibility of agreeing upon all the points necessary to go into an important rule. A rule for the use of 500 different roads must necessarily contain only such points as the 500 superintendents will agree to; and the provision for inserting supplementary rules like 99a was for the express purpose of giving individual roads an opportunity to add whatever they might deem necessary. A dozen qualifying paragraphs might be added to this rule. Suppose a brakeman should meet a train before he had gone ten rods. The rule does not tell him what to do; he must decide for himself. The committee might reasonably answer that the use of the flag was all that could be expected in that case; a torpedo is of little or no value unless it is a considerable distance from the obstruction; and yet if there was a likelihood of its being of any service the committee would doubtless expect the man to know enough to use it. The makers of the rule had to assume that trains would be kept far enough apart to give the flagman time to get back a proper distance. The code has, however, been criticised as weak at this very point. A superintendent recently called attention to the fact that two freight trains running five minutes apart at the very common rate of 15 miles an hour, have only 1½ miles (6,600 ft.), less the length of the forward train, between them. A man starting back at 6 miles an hour would meet the following train within about 1,900 ft., which is less than 13 telegraph poles. At 20 miles an hour the five-minute interval gives only 8,800 ft. lee-way and the man would get only 14 telegraph poles back before meeting the train. The criticism of our correspondent therefore applies on any line with obscure curves, whether the weather be foggy or not, and whether the walking is such as to break legs or is at its best.

Some superintendents will print the uniform code just about as it stands and leave the trainmen to use their own judgment concerning the points that the convention did not touch or did not agree upon. Others will add more or less explanatory matter with a view to clearing up all doubtful points. In our opinion very few have done enough of this; and, unfortunately, those who have done it have not done it with sufficient care and thoroughness. There is little danger of putting in too many rules, provided they are consistent and clear and the men are made to study them sufficiently. The C., B. & Q., in using the word "before," has left a loop-hole for its men to put a wrong construction on the rule. If the wording had been "when on a curve or down grade the distance will be 25 poles instead of 15," the meaning of the writer of the rule would doubtless

have been expressed more accurately, as he probably had no intention of forbidding the use of a torpedo whenever it might seem to the flagman necessary to use one; but the main point of the criticism would still be unmet. The sensible way to provide for the emergencies brought up by "Q" is to insert a supplementary rule or a foot-note explaining them. Every superintendent has to admit the existence of a multitude of unwritten foot-notes, and it would be a good thing if they could be put in black and white. A road which, like the C., B. & Q., has appointed clear-headed men to catechize the trainmen on the rules, does not run so great a risk as do others, for the catechizers will probably discover these doubtful points and clear them up; but by the compiler's omission to carefully consider every point the catechizer's work is made unnecessarily difficult. Roads which do not question their men are simply taking a big lot of chances.

#### The Hot Box.

A communication in this issue calls attention to a persistent evil in American railroad practice, which is hardly known in Europe, and for which the remedy seems obvious. That is, the hot box. The Master Car-Builders' committee on journal lubrication contented itself this year with a very brief report, the sum of which was that there is little use in talking about economical and effective lubrication till we have a journal box that will hold oil and exclude dust. That there are such boxes is well known. Mr. Lauder mentioned one which had run 11 months in passenger service on one of the dustiest roads in the country without being opened. Some of those in use in Europe have been heretofore shown in the *Railroad Gazette*. These boxes are relatively expensive, but they save the cost and danger of hot journals, and give copious lubrication with oil, which reduces the frictional resistance of the journals to the lowest point, thus saving in motive power.

The journal boxes referred to in Mr. White's letter are on the Saxon State Railroad and Eastern Railroad of France. These are both tight boxes for holding oil, with oiling pads held against the journals by springs, and with tight, elastic dust guards. In both cases hot boxes are practically unknown. Yet the pressure per unit of bearing surface is more than twice as great with the Saxon journal as in ordinary American practice.

Very lately there have been published by M. Belle-roche, Superintendent of Motive Power and Machinery, Grand Central Railroad of Belgium, some statistics of results obtained on that road from the use of various lubricants. In the six years from 1871 to 1876, inclusive, hot journals were found each year on 18.5 per cent. of all the passenger and freight cars run. In that period vegetable oil was used. In the six years, 1879-84, the average percentage per annum of cars having hot journals was 16.3 with Russian petroleum. In four years, 1885-88, the average percentage came down to 5.2, still using petroleum. In the latter period the percentage fell steadily from 8.1 in 1885 to 3.1 in 1888. The average mileage of the cars varied but little in the eighteen years, showing that the diminished heating depended upon other conditions than the work performed. The amount of lubricating oil used per car-mile was 2.7 times as great in 1871 as in 1888, and its cost was 17.3 times as great. The amount used has not diminished in the last six years, but the cost has declined steadily, showing a continued fall in the price of the oil. The cost of the material of lubrication per car-mile was less than one-third in 1888 of what it was in 1883, while the quantity was very slightly greater. It is fairly evident that, while with the same service there has been an immense reduction in the number of hot boxes and of cut journals and also a reduction in the amount of lubricant used, there can have been no improvement in its quality. The better results must therefore follow from better methods. M. Belle-roche attributes them to the greater care taken to secure proper inspection and regular oiling. The record of oiling each car is so kept that responsibility for neglect can be accurately fixed, and fines are imposed for any failure in the duty of inspection and oiling. We are not informed as to the kind of journal box used or the intervals at which oiling is done.

On the Saxon State Railroad the passenger cars are oiled every month and the freight cars every two months. Of course, it will be said that in this country it is impossible to have freight cars oiled at regular and sufficiently frequent intervals. If that is necessarily true, it is all the more reason why they should be provided with boxes that will hold oil and keep out dust. Within two weeks the writer passed a long train of loaded coal cars, with more than two-thirds of the box lids gone on the side toward the train in which he was sitting. Under such conditions it is indeed absurd to

talk about economy in lubrication and to fight over an eighth of an inch in the dust guard seat.

#### A Texas Railroad Problem.

The Manufacturers' Association of Dallas, Tex., issued, on June 11, a general call for a convention of farmers, manufacturers and merchants, to be held in Dallas, July 8, to consider the freight rate question. Their circular is emphatic: "The great burden now resting upon the people of Texas is the excessive and enormous rates charged by the combination of railroads now operating in Texas. Millions of bushels of grain are now wasting. Every merchant in the state is struggling under an enormous load, etc." The state of Texas has long been at sword's points with her railroads, and not a few laws are aimed at them. Every railroad to have a legal existence must have its principal office within the state. Texas and Arkansas are the only states which by express laws compel carriers under penalty to deliver shipments on tender of the charges named in the bill of lading. On the other hand, the railroads are exacting every cent the tariffs allow and taking advantage of every technicality in the collection.

The convention, as called, met and adjourned, after appointing a committee to confer with the railroads about a reduction of tariffs. If these cannot agree, then each committeeman is to act in his own legislative section as chairman in efforts to induce the governor to call an extra session of the legislature to fix maximum rates for freight and passenger traffic. An extra session would be necessary, for the legislature, being biennial, does not meet again till 1891. Governor Ross is reported to favor the plan. The demand for a reduction in tariffs, as formulated by the leaders of the movement, asks for a maximum rate on first-class of 25 cents per 100 lbs. for the first 100 miles, then 12½ cents for each additional 100 miles. A comparison will show the extent of this reduction.

GALVESTON, TEX., TO			
Station.	Distance in miles.	Present 1st-class rate in cts.	Proposed rate in cts.
Rosenberg.....	66	32	25
Kenney.....	117	41	37½
Brenham.....	126	45	37½
Milano.....	174	70	37½
Temple.....	218	98	50
HOUSTON, TEX., TO			
Station.	Distance in miles.	Present rate.	Proposed rate.
Hearne.....	121	60	37½
Brenham.....	72	35	25
Austin.....	166	83	37½
Hempstead.....	51	30	25
DALLAS, TEX.			
Stations.	Distance in miles.	Present rate.	Proposed rate.
Gorsicana.....	54	30	25
Garrett.....	33	30	25
Brenon.....	122	61	37½
Hearne.....	144	72	37½

The difference is marked for distances over 100 miles, and on the whole the proposed rates would, if put in force, involve a loss of more than one-quarter of the gross revenue of the Texas roads, their passenger receipts being small.

In 1887 the gross earnings per mile of the longer lines were:

Galv., H. & San A.....	\$3,574
Gulf, Colo. & Santa Fe.....	4,032
Houston & Texas Central.....	5,565
Int. & Gt. Northern.....	3,767

These earnings were insufficient to pay operating expenses and fixed charges. Two of the roads named are in receivers' hands, while the Southern Pacific reports a shortage in 1888 of \$470,000, after paying interest on bonds of the G., H. & S. A., leased by that company. The proposed basis for Texas tariffs is but little higher than that now ruling between Chicago and the Missouri River cities. The difference in the volume of business can be measured by the gross earnings per mile, which for the companies named were in 1887:

Chicago & Alton.....	\$10,532
H. & St. Joseph.....	10,879
Wab. Western.....	6,260

These roads are chosen for comparison rather than other roads whose lines extend beyond the Missouri River, since the extensions modify the earnings per mile. As far as these comparisons of gross earnings go, they show that the present Texas charges are not unjust, while the fact of the receiverships is proof also that earnings are not equal to expenses and fixed charges.

The Texas people refer by way of comparison to the transportation rates charged in other Southern states, Georgia being specially mentioned. Now, Georgia is governed by a railroad commission which has unlimited power in fixing state rates and has issued a positive distance tariff. Let us see how rates and earnings compare in Georgia:

GEORGIA COMMISSIONERS' LOCAL DISTANCE TARIFF.	
Distance.	First-class rate.
10 miles.....	24 cents.
25 ".....	33 "
50 ".....	45 "
100 ".....	62 "
150 ".....	78 "
200 ".....	85 "
250 ".....	90 "
300 ".....	96 "

These distance rates, it will be noticed, do not vary much from those now actually charged for corresponding distances in Texas, and in some cases are higher. Under this tariff the earnings per mile of the Central of Georgia were, in 1888, \$4,511, and of the Savannah, Florida & Western, \$4,909. Comparing with the earnings of the Texas roads, the rates charged in Texas seem again only fair for the volume of business.

These Texas rates have been twice advanced. January, 1888, the rate from the Gulf to Dallas and common points was, first class, 70 cents. This was advanced to 85 cents, and this again put up last spring to 98 cents. It is this last advance which seems to have angered the Texas people, and the policy was questioned at the time by some Texas railroad men, however much the roads may have needed the money.

To all these statements and figures the reply of the Texas agitators is in one word—water. The circular first quoted speaks of "the extreme liberality and generosity in granting the roads of the state valuable franchises and immense donations." It is claimed that the land grants have not been applied toward reducing the cost of transportation, and that the bonded indebtedness includes more than is a fair charge upon the traffic. Stock and bond watering is too large a subject to be disposed of in a paragraph, but it may be noted that several Texas roads have had no grants of land. In the convention a delegate from the Pan-handle said that the railroad there—the Denver & Fort Worth—had increased the value of farms eight dollars per acre, and had received no gift of land. He wanted the railroads let alone, but the sentiment of the convention and of the state is against him. The demand is for reduction in local rates only, since through rates are out of the jurisdiction of the Legislature; but any reduction even in local rates would affect the entire revenue of the roads for the reason that in Texas the through rates are the sum of the locals. The Texas people, like their neighbors in Kansas, are not owners of railroad bonds or stocks, and are inclined to force a reduction of tariffs no matter what innocent holder may be injured. Even if the preposterously low basis mentioned should not be adopted, the Texas roads will probably find it hard to escape some lowering of charges. They are helped by the fact that some members turned the convention toward politics, and thus reduced its influence as a business body.

#### War Measures by Traffic Associations.

The policy for the Inter-state Commerce Railway Association which Commissioner Walker seems to suggest is that certain lines should be selected to fight outsiders, while others should not make low through rates but be left free to make remunerative charges on local traffic. In theory this is possible, in practice we do not believe that it could be made to work.

In the first place the decisions of the Inter-state Commerce Commission will hardly allow it. In the case of Boards-of-Trade Union of Farmington, etc., vs. Chicago, Milwaukee & St. Paul, it was held to be illegal for a company to use one of two alternative routes for the through traffic and charge much higher local rates for the other. "While the inhibition of the fourth section of the statute does not literally apply, the defendant under the circumstances is required to make its rates reasonable on both branches of its road. If the two lines were separately owned and operated, competition might substantially equalize the rates. And the fact that one company controls parallel lines affords no warrant for giving superior advantages to the patrons of one line and denying similar advantages to those of the other line. Nor is it enough that, independently considered as if the parallel line did not exist, the higher rates might be deemed reasonable. They should be relatively reasonable, in view of their relations to each other and their effect upon the public, in order to prevent undue and unreasonable prejudice and disadvantage." (I. Inter-state Com. Rep., 221.)

The case against a traffic association is stronger under this decision than that against a single company. Not merely "might" competition equalize the rates, it presumably would do so, by the very supposition under which the association was formed. And the partial or complete suppression of such competition, which is one of the incidents of the business of a single company, is a main object, if not the main object, of a traffic association under circumstances like those before us; not to speak of the fact that this means of suppressing competition is, independently of its results, an attempt to evade the pooling clause of the Inter-state Commerce Act.

Even if the Inter-state Commerce Commission were disinclined to interfere, there would be no lack of restrictive measures by state authorities. The district which paid higher rates would appeal for protection, and there are at least nine chances out of ten that it

would get it. All the arguments which are involved in the case already quoted would be urged in favor of reduced rates; and most state commissioners would be only too glad to have so plausible a ground for yielding to local demands.

Apart from outside interference, the internal difficulties of such an arrangement would be by no means slight. At first sight it might seem as though the advantages and disadvantages of the fighting roads would just about balance those of the peaceful ones. The peaceful roads would make more money on their local traffic. The fighting roads would get a large amount of through traffic, some of which they might hope to hold after peace was restored. But, practically, there would be a great deal of friction. Each party would think that the other was getting the best of it. Especially would this be true of the freight agent of a peaceful road, who would see his hands tied while all his through business went to a rival line. With such internal difficulties added to the external ones the way of the traffic association would be indeed hard.

#### Export Rates.

The Inter-state Commerce Commission has practically decided that a through rate from interior points of shipment to European ports must consist of the regular inland rate, plus the current ocean rate, as nearly as that can be ascertained. When the fluctuations of the ocean rate are so rapid that through rates cannot be quoted on exactly this basis, the railroads must separate their inland and ocean rate and show on what principle the latter is determined.

We regret this result, but are not surprised at it. In the first place, public feeling was strong against the existing practice. If a railroad charged more for goods destined for domestic consumption at New York than it received for precisely the same service when the goods were to be placed on shipboard, it seemed like the worst form of discrimination. On the face of it, the foreigner was given an advantage simply because he was a foreigner. Furthermore, there can be no doubt that this difference was often made unduly great. Ten cents reduction per 100 lbs. on export traffic was quite common, and greater differences were by no means unknown. There have been cases where firms on the coast shipped goods to Chicago via Liverpool in order to take advantage of the low railroad rates for foreign traffic. We have not known of any similar occurrences on east-bound trade, but the principle involved is, of course, the same. When matters go so far, or nearly so far, as this, there is a great loss somewhere. Whatever may be the supposed necessity under which the railroads justify themselves, the double ocean shipment is a loss to the public as a whole; and it is not at all surprising that the public authorities wish to put an abrupt stop to the system—if it can properly be called a system—which is liable to such abuses.

However natural the present result may be, it is none the less a matter of regret. We believe that it is false in theory and likely to work great harm in practice. Let us take the practical results first. In the year 1887 the wheat crop of the United States was 456,000,000 bushels. In the fiscal year 1887-8 the exports of wheat and wheat flour represented over 125,000,000 bushels. Barring temporary fluctuations, the difference in price between wheat at Chicago and at Liverpool must average something like the transportation charge between the two places. Nobody supposes that the effect of the present decision will be to lower inland rates entirely to the level of the railroad share of export wheat rates. Conformity to the decision will result in a considerable increase in the rate on export wheat—if, indeed, it ever brings it up to the level on which domestic wheat previously stood. The first result of this would be to increase the cost of laying down Chicago wheat in Liverpool. If England depended solely upon the United States for her wheat supply, the English consumers would be compelled to pay nearly all the added transportation charges. But England is not thus dependent upon us. She can obtain wheat from Russia, from India, from Australia, and from a variety of other sources. A very small difference in the transportation charge makes a great difference in the amount of supply drawn from different sources. Some of our surplus which is now taken off would be left on our hands.

A comparatively small surplus of wheat makes an enormous difference in the price which the article bears. It would not be at all surprising if a compulsory difference of ten cents in export wheat rates were ultimately followed by a permanent fall of nearly that amount in the Chicago market price. This result is not likely to be felt this year, because the wheat crop of Eastern Europe and of India seems to have turned out badly, while our own country has, to put it mildly,

no unusual surplus. But the moment we have another year with large crops in various quarters of the globe, we shall feel the handicap put upon us by the forced increase of export rates.

It is true that American consumers will have the benefit of lower prices. But under the conditions which have prevailed during the last few years, any further fall in the price of wheat does more harm to producers than good to consumers. The present system of low export rates, whatever its faults, at least enables the United States to get rid of its surplus stock, and thereby prevents a ruinous fall of prices, without at the same time making inland rates so low as to leave the railroads nothing to pay fixed charges.

This is the practical justification. The theoretical ground for making a difference between domestic and export wheat is this: The transportation charge which an article can pay is limited by the difference between the cost at point of production and value at point of consumption. If one road carries an article the whole distance to its destination it can get pretty nearly the whole amount of this difference, whether the actual haul be short or long; if it only carries it part way, it can only get part of the difference, even though the actual haul be as long in the second case as in the first.

One-tenth of a haul of a thousand miles does not count for nearly as much in the way of receipts as an independent haul of a hundred miles: nor is this due so much to differences in cost of service as many people suppose, but to value of the service rendered. A haul part way to destination will not usually bear so high a rate as a haul of the same or less distance which actually reaches its destination. Our railroad men find this out when any of them try to exact local rates instead of *pro rata* shares of through ones. Now, the railroad haul of export wheat on a through bill of lading is a haul part way to destination. On grounds of cost of service it may seem absurd to make any difference between domestic and export grain. But on the ground of value of service, which is the real basis of rates, there is a radical difference between getting the goods part way to the consignee and getting them all the way, even though the actual haul be the same.

#### The Faults of Time Tables.

It is to be supposed that railroad guides are as clear and comprehensible as human ingenuity can make them, and yet it is a perfectly plain fact that not one person out of twenty can make anything out of one without assistance. The train that one is looking for must be hunted out of a dozen upright columns of closely printed small figures and letters which appear to be simply a mass of "A. M.'s" and "P. M.'s" that are continually changing place, of stars, daggers and section marks. Half the trains appear to be "leave-arrive" trains, and the other half "arrive-leave" trains. \* \* The trains on one side of the column of the names of stations may be read in an ordinary sitting posture; but in order to make anything out of those on the other side of the column, the simplest way is to stand on one's head, which brings them all right. Then when one thinks he has mastered a general idea of the scheme, he is sure to come upon some railroad's own particular and private time-table which completely reverses the rule, and then the thing has to be learned all over again. And when one has hit the key at last, and found his train, and traced it triumphantly from station to station to its destination, what a cruel shock it gives one's overwrought nerves to find that it gets there some hours before it has started. \* \* —*Boston Transcript*.

It appears that there still are some people other than ticket agents and commercial travelers who consult railroad guides; though most guides apparently have given up the hopeless task of making a compact volume which shall contain perfectly clear time tables of the roads in any considerable territory. Whether this is the best practicable disposition of the matter in all cases we cannot say; but in the case of the one comprehensive work, the *Official Guide*, it is probably true that the attempt to do the work in any more elaborate manner than is at present pursued would defeat its own object. The book is already very bulky, the price not inconsiderable, and the type as small as is reasonably tolerable. Any improvement in typography or arrangement would require much additional paper and the thousands of time tables shown every month would, if spread out in ideal fashion, make a book worth \$25 a year. But the *Transcript's* indictment touches the railroads at another point, to wit, their official time tables, both posters and folders. The average table, especially if it is that of a large road, is only a little better than the abnormally condensed guide. Many of the larger roads get up very good and clear tables of their best trains, such as the "New York & Chicago Limited," the "Burlington's No. 1," and others, and the passenger has little to complain of; but the great bulk of the trains are treated with far less care. The existence of these special tables is evidence that good ones can be made, and it is therefore fair to ask whether the process is not easy enough and simple enough to warrant its use for the benefit of all passengers.

The object of a public time table is to relieve the ticket seller from answering questions; and a catalogue of the interrogatories that some agents encounter would show that to do this it is necessary, among other things, to:

1. Give good public notice several days in advance of the date a time table is to be put into effect; or what is better, post the tables themselves immediately below the old ones.

2. To head all these documents distinctly "Time Table."

3. To head each portion with the name of the division or branch.

4. To make separate tables for Sunday trains.

5. To have every line of type horizontal, and to place all explanations (such as usually go at the foot) at the head of the table, or if they occupy too much space for this, to put at the head a plain reference to the place where they may be found.

6. To show every stopping place, even the smallest, and to indicate old names of stations where changes have been made, and post-office names where different from the railroad names.

7. To omit "Summer Arrangement" and such-like designations where the table may last perhaps all the year.

8. To print train numbers in type very different from that used to indicate hours.

9. Where two trains are shown in the same column to separate them by two very heavy horizontal marks.

10. Where a train crosses the noon or midnight hour to show a. m. or p. m. at every station throughout its trip.

11. On long lines to show the day of the week (assuming a certain day for starting).

12. To show a clear map of the road.

13. Where necessary to read up to say "Begin at the bottom of the column and read toward the top."

14. To place trains in order, beginning at midnight on the left, and pursuing this plan rigidly, even if a whole column has to be used for a short train. To make mention of a train only in a foot note is one of the most fruitful causes of perplexity.

All these points are suggested by faults recently noticed, and they by no means exhaust the list. But, as intimated above, there are apparently plenty of passenger men who can get up good tables; the question is why they do not do it. Aversion to a radical change, lack of time, the increased expense for paper, are some of the reasons. As the problem is doubtless much easier than it seems, it would probably be a good move to offer a prize to the man who should present the best model to the General Ticket Agents' Association or to the General Time Convention. Judging from experience, the last named body has not time to deal with such trifles of detail, however. A smart Chicago traffic man recently offered the local ticket agents of the country a prize for the best design for a trade-mark for his road. These men would be just the ones to get up a good poster or folder, and some one would do well to give them a similar inducement in this line. In doing this a general passenger agent would not perhaps be getting so much immediate glory for his own line, but he would make sure of that sort of reward which follows all true virtue.

Of course the possession of good time-tables will not of itself enable a road to do its full duty to the public in this line. A poster printed on the best white paper with the best black ink in clear and tasteful type might still be so small that an increase of 25 per cent. in size would add 100 per cent. to its value. The addition of small maps on a large scale showing connecting roads in the principal cities would be a more profitable investment for many roads than the rhetorical white lies that they are wont to fill their documents with. Posters and newspaper advertisements will bear more looking after than they receive. All places in which posters are placed should be recorded and tables renewed as promptly as are those in the stations. Places not regularly visited by an agent should be occasionally looked after, and those neglecting to keep the latest issue posted should not be allowed to have any more. Regularity in date of change would be a great advance, but American roads do not seem to appreciate its convenience. This and a fixed period for advance notices would not be difficult of attainment, certainly to a considerable degree; but apparently Congress will be allowed the honor of first putting the reform into effect, as has been the case with publicity of freight rates.

We have received a communication from the Railroad Commissioner of the State of Virginia confirming the statement published last week that the Norfolk & Western train wrecked near Thaxtons was undoubtedly set on fire from the fire-box of the locomotive. He states explicitly that there was no explosion of lamps. The Commissioner has sent us a statement made by a civil engineer, Mr. Burton Mayre, who was a passenger on the train. This statement is corroborated by several passengers who were competent to give an intelligent account of what actually happened. Mr. Mayre's statement is that the fire broke out about 40 minutes after the wreck, and he is confident that no people came to their death from the fire. He heard no cries for help for 20 minutes before the fire broke out. This passenger says that, while the conduct of the railroad officials was all that could be asked, the behavior of the conductor and porters of the first Washington sleeper and the vestibule car, which did not leave the track, was outrageous. Not one of them went down the bank to help the passengers confined in the wreck, and, indeed, with two exceptions, this is also true of the passengers who occupied the vestibule car. It is hard to imagine that such a statement can be true.

The cumbersome method of keeping baggage records prevalent in Germany is described by a correspondent in another column. It is certainly more business-like than the English fashion of keeping no record at all, but it will seem pretty absurd to the American baggage master, and make him thankful that all passengers do not have extra baggage, the records for which are considerably like the German documents, though the very numerous abbreviations employed here make their use comparatively easy. It is probable that the mistake of checking to wrong destination is not so fre-

quently made in Germany as with our plan, and mismatched checks should be out of the question there; but considering our extensive and complicated routes, and the great volume of business, the trouble from misrouting and losses is really very small. The annoyance in individual cases, however, is great, as for instance that of a passenger arriving in Springfield, Ill., who finds that his trunk has gone to Springfield, Ohio; and the victims could doubtless wish for a system requiring more careful attention from the checker than the hastily manipulated "brasses"; but the latter are nevertheless the better. It is interesting to note that Mr. Kirkman's scheme of multiplex blanks is proposed in Germany. We trust he has taken out a patent in that country.

The West End Street Railway of Boston has recently adopted a new system for running its electric cars in some parts of Cambridge and Arlington, which, it is believed, has not been previously in use anywhere in New England. Beginning July 6, these cars stop only at certain designated points, or "stations," about one-fourth of a mile apart, between Arlington and Harvard Square, thus enabling them to load and unload much more quickly, and to run at a greater speed between the stopping places. Much of this distance is through a very wide street not crowded with teams. Most business residents of this section are heartily in favor of the new plan, as it materially shortens the time to Boston, but those who have been accustomed to hail a car from their doorsteps, wait until it stops, and then make their way leisurely to the middle of the street while the conductor and passengers waited with impatience, naturally grumble at having to walk one or two squares, and to be "on time." The new departure is an important advance in the direction of improved service for people living in the suburbs and dependent upon street cars to reach their places of business. The same plan might be with great advantage introduced on most lines where the cars run long distances and where steam or electric motors are in use; and, with less advantage where horses are used.

There has been a good deal of speculation as to the actual strategic significance of the sale by C. P. Huntington of 100,000 shares of the stock of the Chesapeake & Ohio to a purchaser supposed to represent the Vanderbilt interests. The transaction is explained by Mr. Huntington so far as he is concerned by the statement that he wishes to get rid of his interests east of the Mississippi. On the other hand, the reputed purchasers have a good deal of money, for which they must find a place, and they may consider Chesapeake & Ohio at 22½ a good investment quite irrespective of any great combination. All this is simple, and may be a sufficient explanation of the transaction. Newport News is probably destined to grow in importance as a port for certain great staples. It is a cheap port, commodious and convenient to coal and iron fields. A line to that port from the country served by the consolidated "Bee Line" and "Big Four," and controlled by the same interests as the consolidated roads, may become a very useful property without interfering with the interests of the Vanderbilt lines to New York.

The New York Railroad Commissioners have been called upon to decide a somewhat curious case, where the Rome, Watertown & Ogdensburg receives, as its *pro rata* share of a through rate, a larger sum than it charges for local shipments over the same route (Cheese to Syracuse and the same commodity to New York City and Philadelphia). The Board is of the opinion that such a difference is unwarrantable, but inasmuch as the through business is inter-state commerce, and therefore outside their jurisdiction, they have nothing to say about it. In the same case there is a separate complaint of discrimination, because rates from Oswego are lower than from intermediate points. The Board goes back to the Louisville & Nashville case, and holds that the existence of water competition presumably justifies some difference; in other words, it will not declare the difference illegal on general grounds, unless there are more specific evidences of damage to complainant than have yet been brought forward.

#### NEW PUBLICATIONS.

*Thermodynamics of the Steam Engine and other Heat Engines.* By Cecil H. Peabody. New York. John Wiley & Sons, 1889. 8vo., pp. xviii, 470. Price, \$5.

By this time nearly every technical school of any pretension in the United States must be provided with its own textbook on thermodynamics, and some institutions have two or three. Such a result can hardly be accomplished without considerable waste of useful energy. There must be some method of teaching this subject which is, all things considered, greatly superior to all other methods; and if the professors would form a "trust," for the purpose of discovering and developing the ideal course on thermodynamics, they would not only benefit their own students but also the professional world at large.

Professor Peabody, in the present work, does not follow the time honored method of developing complicated theories and then explaining that in practice there are so many modifications as to render the theories useless. He rather follows the methods of Hirn, Zeuner and Hallauer, illustrating the section of steam in the cylinders of engines, by examples drawn from practice. Of course the fundamental principles of thermodynamics are given in analytical form, and this part of the work shows but little peculiarity, except as regards some of the data. The author uses Professor Rowland's determination of the mechanical equivalent of heat, 778 ft. lbs. at 62 deg. Fahrenheit and in latitude 45 deg. He also uses the same experimenter's data for the specific heat of water, calling it unity at 62 deg. Fahrenheit. These are the values which Professor Peabody employed in calcula-

ting his "Table of the Properties of Saturated Steam and Other Vapors," a work intended to be used in connection with the present treatise.

The chapter on "Saturated Vapor" contains a good summary of the rules and data required for calculating steam tables; and the following chapter, on "Superheated Steam," gives the most recent data relating to this subject. In fact, from this point in the work, the theoretical treatment is conformed to practical results, and the discussions are concise and clear. Thus, the outflow of steam and air, the action of injectors, the expansion of steam, and the relative proportions of the cylinders of multiple expansion engines, are illustrated by numerous practical tests and examples; and in describing the method of testing steam-engines, the most prominent forms of calorimeters are described. Then follows a large number of tests of steam engines, given in considerable detail, with the discussions which accompanied the original reports. As these experiments were performed for various purposes, such as to determine the gain from increasing the pressure of steam, from jackets, from expansion, from condensing, from superheating and compounding, a study of the results and discussions, will aid greatly in settling these disputed questions. The author seems to have copied the data literally in most cases, so that the results obtained by foreign experimenters are given in metric measures. This renders them less useful for ready comparison with similar experiments made in the United States or in England, and detracts somewhat from the value of the book as a work of reference. The author, in his preface, states that the treatise is intended to be used as a text-book; and on this understanding, the presentation of experiments in their original form may not be undesirable, since it will require some calculation and investigation on the part of the students. A selection is given in the accompanying table, from the numerous results contained in this treatise; and the table will afford a fair idea of the best and most wasteful performance of first-class engines, with brief indications of the reasons for the waste or economy.

Consumption of Steam Hourly per Indicated Horse Power.

TYPE OF ENGINE.	Boiler pressure, lbs. per sq. in.	Maximum consumption.		Boiler pressure, lbs. per sq. in.	Minimum consumption.	
		Cut-off, fraction of stroke.	Lbs. of steam hourly per indicated horse power.		Cut-off, fraction of stroke.	Lbs. of steam hourly per indicated horse power.
Simple engine, un-jacketed, condensing.....	"Michigan".....	12	.089 46.09	21	.145 33.08	
	"Dexter".....	41.9	.152 31.79	68.7	.183 23.86	
	"Dallas".....	27.4	.386 30.99	35.4	.133 36.69	
Simple engine, un-jacketed, condensing, and non-condensing.....	Harris-Corliss (non-condensing).....	70.9	.025 73.14	69.2	.130 35.69	
	Reynolds-Corliss.....	96.6	.160 25.9	95.8	.124 20.6	
	Haris-Corliss.....	96.3	.136 23.9	96.1	.119 19.4	
Simple engine, un-jacketed, condensing, saturated, and superheated steam.....	Wheelock.....	96.3	.170 24.9	96.3	.131 19.5	
	"Mackinaw".....	52	.23 36.04	53	.21 22.73	
	"Eutaw".....	26	.50 32.69	26	.50 25.09	
Compound engine, condensing, un-jacketed.....	Harris-Corliss (non-condensing).....	50.2	.143 42.2	50	.39 31.7	
	Hirn engine.....	51	.257 20.8	55.7	.163 16.47	
	"Leila" (superheated steam).....	57	.313 28.1	127.2	.140 16.0	
Compound engine, condensing, un-jacketed.....	"Gleam" (steam slightly superheated).....	112.1	.093 19.83	110.1	.191 17.86	
	"Siesta" (saturated steam).....	48.7	.294 21.8	91.4	.169 16.7	
	"Bache".....	81.4	.050 25.11	80.2	.143 20.33	
Compound engine, condensing, jacketed.....	"Rush".....	36.7	.248 22.69	69.1	.161 18.38	
	Leavitt pump engine.....	98.6	..... 14.2	99.4	..... 13.9	
	Stationary engine.....	38.6	.167 20.8	30.8	.053 16.06	
Miscellaneous, compound engines, condensing.....	Worthington pumping engine.....	60.3	..... 17.7	75.2	..... 17.41	
	"Gallatin" (with and without jacket).....	68.5	.150 21.9	69.9	.148 20.7	
	French marine engines.....	.....	.376 25.12	.....	.169 18.46	
Miscellaneous, compound engines, condensing.....	Stationary engines.....	91.8	.16 17.7	92.2	.160 16.9	
	Pumping and mill engines, compound and simple.....	40.4	.571 32.02	61	.073 14.84	
	Willan's engine.....	60.3	..... 17.7	75.2	..... 17.41	

In compiling this table the most economical and the most wasteful performance in each group of experiments were selected, as shown; and the table will repay careful examination, illustrating, as it does, the effect of variations either in design or in method of operating.

*A Theoretical and Practical Treatise on the Strength of Beams and Columns.* By Robert H. Cousins. E. & F. N. Spon, London, and 12 Cortlandt street, New York, pp. 170.

This work claims to set forth "the correct and new theory of the transverse strength of materials," and we will first examine this claim. The theory is stated on page 31, and the hypotheses which we wish to consider are:

"1. The fibres of the beam on its convex side are extended, and those on the concave side are compressed in the direction of the length of the beam, and there are no strains but those of extension and compression.

"4. The axis or origin of moments for the tensile and compressive resistance of the fibres of any section at right angles to the length of the beam is a line of the section at its intersection with the top or compressed side of the beam.

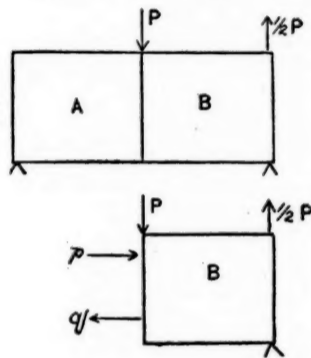
"6. The bending moment of the load at any section is equal to the sum of the moments of resistance to compression and extension of the fibres, or to the moment of resistance of the section of the beam.

"7. The sum of the moments of resistance of the fibres to compression is equal to the sum of the moments of resistance of the fibres to extension.

"8. The algebraic sum of the direct forces of compression and extension can never become zero."

The "9th" is involved in the "6th."

To examine the "8th" hypothesis: We do not find any analysis to support this hypothesis, and it is immaterial if there is, since its fallacy may be determined by means of unquestioned principles of mechanics. Conceive that a cross-section of a beam subjected to loads acting normally to it be made at any point of a beam; and, to be more specific, let the beam be supported at its ends and loaded at its middle, and that the cross-section is also at the middle. Conceive that one part of the beam, as *A*, is removed. Let forces be applied at all points of the section



exactly equal in magnitude and direction to those acting at those points before the ideal section was made; and to make the case general, conceive that any or all the forces are oblique to the section. Let the oblique forces be resolved into components parallel and perpendicular to the plane of the section. It will be clear that those perpendicular to the plane will produce tension in the fibres if they act outward from the part *B*, and compression if inward. Those parallel to the plane will produce shear, tending to cut the fibres off transversely. Since the applied forces, after equilibrium is established, are not to move the beam, we have a clear case of statics, according to which the sum of the forces parallel to one axis is zero, and also those parallel to a perpendicular axis must be zero. According to the usual notation, let one axis be  $x$  and the other  $y$ , then we have

$$\Sigma X = 0 \text{ and } \Sigma Y = 0.$$

We need consider only the  $x$  forces, or those parallel to the axis of the beam. These must be zero. Any theory formed on a contrary supposition contains a fallacy. If a theory containing a mechanical absurdity leads to rational results, it does not prove that the "fallacy" is "truth," but rather that some other error must be involved to offset the first error. Hypothesis 8 is erroneous. The equilibrium of forces in part *A* will be established by introducing into the cross-section forces equal, but contrary, to those supposed to act on *B*. That is, forces equal respectively to those represented by  $p$  and  $q$ , but opposite in direction, and also the transverse shearing forces. In this way the equilibrium of each part is established if an actual section be made at our ideal one.

Next consider the 7th: All the argument we find for establishing this principle is on page 23, and this certainly is insufficient. Resorting again to the established principle of statics, it follows that the sum of the moments of all the forces in reference to any origin must be zero for equilibrium; therefore, if the sum of the moments of the internal forces is zero, then when the part *A* is removed the sum of the external forces will be zero, which plainly is not true. It is true that the sum of the moments of all the external forces is zero, but it is not true that when half the beam is removed the sum of the moments of the remaining external forces will be zero. If, however, the internal forces  $p$  and  $q$  be now considered as external, as they may be, then will the sum of the moments of the external forces acting on the part *B* be zero, from which it follows that the moments of  $p$  and  $q$  cannot be zero.

This hypothesis is not new. It was assumed by Barlow some forty or fifty years ago, although the correct principle had been stated by Coulomb more than a century ago, and by several other writers. Barlow abandoned it in his later work, and it has been a long time since it has been brought forward. Hypothesis 7 must be abandoned.

The author, in applying principle 6, violates a principle of mechanics. The origin of moments in our figure is at the upper end of the section, and the compressive forces tend to turn the piece left-handed about the origin, and the tensile forces right-handed; in which case the algebraic sum of the moments is the arithmetical difference—or zero. According to the theory in common use, this fallacy does not follow; for the resultant of the compressive and of the tensile forces form a couple whose moment is constant wherever be the origin of moments. This shows that it is not necessary to assign the origin of moments—as is done in hypothesis 4.

In the first hypothesis it is asserted that there are no

strains but compression and extension. While this is so considered in the common theory, yet as an abstract proposition it is not true, for there are shearing stresses and strains, both longitudinally and transversely. If there were not such forces, the upper half would slide over the lower half along the neutral surface. Several smooth boards, one above the other, supported at their ends and deflected, will illustrate the want of shearing resistance by their ends projecting one beyond another. But argument is unnecessary; theory and practice recognize it.

It is hardly necessary to note any deductions made from this "new" and in "correct" theory; yet we are curious to know how it is found—from this theory—that "the moments of resistance of circular sections are to each other as the cubes of their radii," page 57; or "the moments of resistance of hollow, circular sections are as the squares of their radii," page 62. These appear to be inferences from the common theory and not from the new.

On page 99 is the following observation: "From which it will be observed that the eye-beam, while containing only 31 per cent. of the area of the rectangular beam, is able to sustain 42.5 per cent. of its load, which is supposed to be due to the elevation of the elastic limit during the process of rolling, or the top of the beam must have been laid with steel."

The author here appears to overlook the fact that the form of the section is quite sufficient to account for the difference in the strengths if the material were identical in both.

Many results found by the author agree fairly with those of direct experiment; and in some cases it may give better results than those found by the common theory, but in some cases which we computed by the common theory gives better results with more simple equations. While the common theory does not violate the principles of mechanics, it does not generally give results agreeing closely with those of experiment, and the cause of the discrepancy is well known. It is because the hypotheses do not agree with nature after the elastic limit is passed. After that is passed the neutral line probably—in fact, quite certainly—moves towards the compressed side, after which the stresses are no longer proportioned to the distances from the neutral line, but instead thereof the stresses on the overstrained fibres near the outer surfaces are more nearly equal. This departure from the assumed law exists in all cases of rupture, and is no more recognized in the "new" theory than in the common. Within the elastic limit, beams of homogeneous material and normally loaded, the neutral line passes through the centre of gravity of the transverse sections—as shown both by theory and experiment; and the common theory is practically exact for this case.

*Business Chart Showing the Course of Business in the United States for a period of Thirty Years.* By Roderick H. Smith, No. 6 Wall street, New York. Price \$1.

This chart shows, by diagrams of different colors, the statistics, year by year, of railroad construction, immigration, failures, and imports and exports. The annual product of pig-iron is also shown, the prices of railroad stocks, the number of shares sold on the New York Stock Exchange, and the bank clearings at New York. In a tabular form is also shown the aggregate net circulation of money each year from 1873 to 1888, inclusive. This same chart was published last year, but in its present form it is much smaller and clearer, and more convenient for reference. It is well printed, on stiff cardboard, 14 x 21 in. in size.

The technical articles in *Scribner's* for August are "How to Feed a Railway," by Mr. Benjamin Norton, Second Vice-President Long Island Railroad, and "Electricity in Lighting," by Prof. Henry Morton.

#### The Newer Uses of Wire.

It is a circumstance which cannot have escaped notice that within the past few years the application of wire to different purposes has been widely extended, and there is now a large variety of uses for which it is successfully employed. So general, in fact, has its adoption become that the present has been characterized as the wire age—a term expressive enough to make comment almost unnecessary. This has, in a measure, arisen from the fact that makers of wire have been compelled to look carefully over wide areas for new outlets for the product of their mills. The advance in the efficiency of these mills, including especially the trains for rolling the wire rods, within five or six years past, has been something surprising; in fact it is a clear case of the adaptation of a high speed class of machinery to a line of work which has previously been done at considerably lower speed and at far greater cost for repairs of fixtures than later mills have yet required.

Disregarding some of the more common and well-known uses of wire, as, for example, in the field of applied electricity and the manufacture of wire rope, we find that a large and growing demand for it has sprung up in turning out barbed wire fencing, the manufacture of which, in a comparatively short space of time, has assumed commanding proportions. It is not difficult to realize that in this industry alone enormous quantities of wire are consumed. Wire door mats also have become generally popular, and have been the forerunners of woven wire matting for covering the floors of railroad passenger cars, and for various other purposes which will readily suggest themselves. Cleanliness, durability and economy are points which have been claimed for such matting with good reason, practical test having in every case given highly satisfactory results.

A somewhat unusual application of wire has been made in the construction of ordnance, of which the Longridge wire gun in England and the Woodbridge gun in this country are

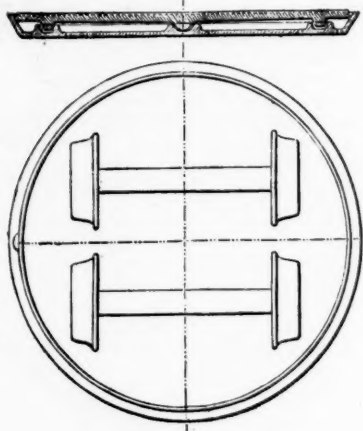


Fig. 1.

TURN-TABLE FOR SHOPS, ETC.

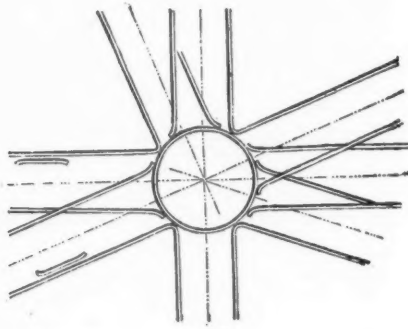


Fig. 2.

interesting examples. While the results of actual firing tests of guns of this type have not been in every way encouraging, the principle of their design has some things to commend it, and the idea may yet be carried out in a thoroughly successful manner. In the Woodbridge gun a steel cylinder was surrounded by hammered steel bars reaching the entire length, and around these was wrapped the wire while under tension.

Another use to which steel wire, in a braided or woven form, has been applied, is its adaptation to belting for driving machinery. Some things may be said both for and against this use of the material. Metallic plates or bands have been used more or less for belting for many years, but however perfect their working may have proved in some cases, they are almost beyond hope of repair when trifling weakness begins to show itself. Braided or woven belts of wire could be more easily repaired, and if made of a comparatively firm wire they would in all probability hug a pulley over its entire width more perfectly than any band could when made of plates or sheets. It seems almost unnecessary to remark that the absolutely unyielding nature of the material of which the wire is made at the points of actual contact is wholly different from that of the slightly compressible leather or rubber-covered canvas generally used. Hence, it could hardly be expected that equally favorable results should attend the use of the wire fabric until, as has been proposed, the yielding material is supplied in the shape of an elastic cover fitted to the pulley. This, however, introduces in an important manner the element of wear, and the pulley covering would, no doubt, be rapidly destroyed. The question of joints in such belts also has suggested difficulties, all of which, however, would seem to have been, in the main, overcome. At any rate, wire belts, we understand, are in successful use at Beaver Falls, Pa., driving machinery of various kinds.

As a means of turning out fire-proof stage scenery, for theatrical use, wire has finally found another interesting application. The fire-proofing solutions and paints hitherto employed in connection with the scenery in current use have been found insufficient from the fact that they are unreliable, and, further, are frequently objectionable because of their destructive action on the materials to which they are applied. As a substitute for these latter, therefore, the fabric employed for the familiar wire window screens suggested itself, being thin and flexible almost like canvas, and admitting, when closely woven, of being decorated by scene painters in the ordinary way. The only objection which appears to have presented itself was in the circumstance that the wire gauze may be easily seen through. To overcome this, however, a special paste has been prepared which is of light weight, and, when applied to the gauze, effectually closes up all the small openings. It, moreover, does not detract from the flexibility of the fabric, nor does it injuriously affect its fire-proof character. Besides all this, we are told, the paste, when once applied, does not crack. Wire-gauze scenery prepared in this way will, according to German report, shortly be used in an experimental way in the court theatre at Munich.

#### Turn-table for Shops and Factories.

A shop turn-table invented by M. Ramu, and largely used in France, is shown in the cuts given herewith. It is certainly simple, and appears to be well calculated to cover all practical requirements in the service for which it is designed.

As shown by fig. 1 this device is composed of two parts; the plate, with tempered pivot and slides, the base with a central tempered bearing for the pivot, and an oil-groove in which the slides work. It has neither rollers, axles, circular track, rods, rails or grooves on the plate; all these details, which require continual supervision and repair, being suppressed. It will be seen that the pivot is placed on the plate, the bearing forming a part of the base. This arrangement facilitates oiling the pivot; the oil remains in the bearing, always in contact with the parts it is designed to lubricate.

Thus reduced to two pieces, the turn-table needs but little attention, and is always ready for use. This is a point of particular importance. It often happens in the shop that a number of cars must be moved over the rails in different directions. Under such circumstances it is necessary to

have turn-tables which can be operated rapidly, and the present arrangement answers this requirement perfectly. As above remarked the Ramu turn-table has neither rails nor grooves. Experience has demonstrated that this is the best arrangement for shop railroads. Turn-tables with rails at right-angles can only be operated slowly, and are only suitable for two tracks perpendicular to each other; while tables without rails are always ready to receive a car coming from any direction they can be turned at any angle and used to connect a large number of tracks. Thus, a plate 33 in. in diameter will connect 8 tracks having a gauge of 19.5 in., as shown in fig. 2. It can even be used for curved tracks if they meet the plate in tangent lines.

The plate remains in position when a car is rolled upon it and a little attention from the operator will stop it exactly opposite the track to which the car is to be directed, and to facilitate the passage the rails are slightly curved at their points of contact with the base, as shown by fig. 2.

In many cases the presence of rails, projections and locks is useless when the cars pass frequently, and it is necessary to change their directions; the operator would have no time to use the lock.

For the cuts and description of this turn-table we are indebted to *L'Industrie Moderne*.

#### The Heat of Combustion of Carbon.

Messrs. Berthelot and Petit have recently published in the *Comptes Rendus* an account of their experiments on the heat of combustion of carbon in the various conditions of amorphous carbon, graphite and diamond. The principal portions of their report are given below.

Without considering the experiments of Lavoisier and Laplace, nor the figures of Dulong, which were inaccurate by reason of the production—not suspected at the time—of some carbonic oxide, we may recall the more accurate tests made by Favre and Silbermann, which have hitherto been accepted, and have not been repeated by any one on account of the great difficulty of this class of observations. The formation of some carbonic oxide, with from 2 to 30 per cent. of the total amount of carbon, the slow combustion, which continued as long as 48 minutes, the necessity of frequent weighings and a supplementary combustion, render the measures of heat very troublesome, and give the results an uncertainty which seemed to us worthy of correction.

Let us commence with *amorphous carbon*. We prepared it from wood-charcoal, pulverized, then treated with boiling hydrochloric acid, with hydrofluoric acid, with chlorine at white heat, and finally calcined. The product, dried at a temperature of 266 deg. Fahrenheit, was free from hydrogen. It contained, in 100 parts by weight, 99.34 of carbon and 0.66 of ashes. Its combustion in a calorimetric sphere, surrounded by oxygen compressed to 25 atmospheres, was accomplished without difficulty—the combustion was complete and rapid. The whole operation did not require more than four minutes. We made six experiments, and deducting the ashes the results are as follows:

Experiment.	Weight of carbon burned, grains.	Total heat of combustion, British thermal units, per pound.
1.....	12.5.....	14636.7
2.....	10.1.....	14655.2
3.....	13.0.....	14641.7
4.....	13.5.....	14653.1
5.....	6.7.....	14645.9
6.....	14.5.....	14650.9
Average.....		14647.3

Favre and Silbermann found an average value of 14544 British thermal units per pound. The variation from our figures is about 1 per cent. Considering the complication of their method, it is surprising that greater difference does not exist.

*Crystallized Graphite.*—We used graphite from the foundry. It was purified by repeated treatment with hydrochloric acid, then washed and dried in an oven. Its analysis in this condition gave for 100 parts by weight: carbon, 99.79; ashes, 0.19; hydrogen (probably moisture), 0.02. The combustion of this graphite gave for its carbon (mean of two experiments) 14219.5 British thermal units per pound.

We thought it desirable, for greater accuracy, to raise the graphite to a red heat in the presence of air, which freed it from the trace of hydrogen. After this it was burned in the calorimetric sphere. As it was not readily ignited by an in-

candescent iron wire, we mixed it with a more combustible substance, selecting naphthalene, a compound whose heat of combustion—determined by four sets of experiments, made by three groups of experimenters and with three different instruments (see *Annales de Chimie et de Physique*, 6th series, vol. 13, pp. 303 and 326)—can be regarded as very accurate. The weight of this auxiliary combustible varied between one-fourth and one-fifth that of the graphite. The following results were obtained:

Experiment.	Weight of graphite carbon, grains.	Total heat of combustion, British thermal units, per pound.
1.....	15.0.....	14238.7
2.....	7.5.....	14213.7
3.....	13.3.....	14221.1
4.....	10.4.....	14221.1
5.....	12.2.....	14221.6
Average.....		14223.2

Favre and Silbermann obtained for two specimens of graphite 14023 and 13972 British thermal units per pound. The extreme difference from our figures amounts to nearly 1 per cent. These experimenters used wood-charcoal, about  $\frac{1}{4}$  of the weight of the graphite, for an auxiliary combustible.

*Diamond.*—We attached great importance to measuring the heat of combustion of the diamond on account of the theoretical interest connected with this form of crystallized carbon, so different from the two others in most of its properties. But its high price renders the experiments very costly. Fortunately, a diamond merchant, Mr. Leopold Traub, was so generous as to give us 23 carats of diamonds for use in our experiments. We are under great obligation to him for his scientific generosity. We were thus able to test the crystallized diamond (Cape diamond) and the black diamond, which cannot be split, known as *bort*.

The combustion of the diamond is effected without difficulty, using crushed fragments mixed with naphthalene in the proportion of from  $\frac{1}{100}$  to  $\frac{1}{50}$ , the weight of the diamond. We obtained, ashes ( $\frac{1}{100}$ ) deducted:

Experiment.	Weight of diamond carbon, grains.	Total heat of combustion, British thermal units, per pound.
1.....	13.2.....	14136.5
2.....	5.8.....	14150.5
3.....	11.0.....	14152.0
4.....	12.6.....	14145.8
Average.....		14146.2

Two experiments were made with *bort*, giving about the same results as for the ordinary diamond:

Experiment.	Weight of carbon bort, grains.	Total heat of combustion, British thermal units, per pound.
1.....	6.5.....	14156.5
2.....	7.7.....	14142.8
Average.....		14149.6

Favre and Silbermann made only 2 experiments, using in all 9 carats of diamonds, mixed with 23 grains of charcoal, which greatly detracts from the accuracy. They obtained 13386 and 14180 British thermal units per pound. They prefer the first number, the only one contained in their final table. The difference from our results is more than 1 per cent.

As a result of our experiments it will be seen that the ancient values for the heat of combustion of carbon, hitherto adopted ought to be sensibly increased, the same increase being required in all the carbon compounds.

#### TECHNICAL.

##### Locomotive Building.

The New York Central & Hudson River Railroad will this week let contracts for 56 new locomotives. The number will include 50 freight engines, with six wheels coupled, and cylinders 19x26, weighing 60 tons each; five passenger engines for local service on the Harlem Division, ordinary American type, 17x24 in. cylinders, weighing 42½ tons each; and one dummy engine, for hauling freight on the New York city street tracks.

The New York Locomotive Works, Rome, N. Y., has just delivered to the New York & New England two new freight locomotives, weighing 65 tons each. The road is to have five more machines of the same pattern. Negotiations are pending with the Union Pacific for the construction of a number of consolidated locomotives, to weigh 75 tons each.

##### Car Notes.

This week the Erie Car Works finished the contract for ice cars for the Silver Lake Railroad, and will at once begin on a contract for 200 gondola cars for the same road. It is a small line running from Rochester to Spring Lake, N. Y.

Two hundred box cars have just been ordered by the Evansville & Terre Haute.

Orders for freight equipment recently placed by the Northern Pacific are among the heaviest of the year. The cars just ordered are of four classes, and aggregate 2,400, in addition to the orders placed earlier in the season for 500 furniture cars. Of these, the Peninsula Car Co., of Detroit, Mich., are building 400 and the La Fayette Car Co., of La Fayette, Ind., 100. The orders just placed are distributed as follows: Peninsular Car Co., Detroit, 370 box, 300 stock, 300 flat and 300 gondola coal; Barney & Smith Manufacturing Co., Dayton, Ohio, 430 box; United States Rolling Stock Co., 350 box; Wells & French Car Co., Chicago, 350 box.—*Northwestern Railroader*.

##### Bridge Notes.

Plans and specifications for the iron bridge over the Acushnet River at Fairhaven, Mass., have been prepared. The bridge will have a draw, and will be 450 ft. long, with 32-ft. roadway.

The county of Rockbridge, Va., is to build two bridges, one near Goshen and one near Riverside, over the South River.

The King Iron Bridge Co., of Cleveland, has been awarded the contract for building an iron bridge over Smith River at Leaksville, N. C., for \$4,900.

B. A. Cregin has closed a contract with the Supervisors of Kings and Queens counties, N. Y., for building an iron bridge over Newtown Creek at Grand street, Brooklyn. The bridge will have a stone substructure and piers, and will cost \$163,500.

Proposals are wanted until Aug. 5, for erecting the superstructure for the iron bridge at Cedar avenue, Baltimore, to cost about \$60,000.

The Dravosburg Bridge Co. has let the contract for substructure of its bridge to C. I. MacDonald and W. C. Jutte, and for superstructure to the Keystone Bridge Co., of Pittsburgh.

The R. F. Hawkins Iron Works, of Springfield, Mass., is building a bridge over the river at Elm street, Dalton, N. Y., at a cost of \$7,500.

John Stewart, New Glasgow, N. S., has been awarded the contract for constructing an iron bridge across the John River, N. S. It will contain one 160 ft. and two 80-ft. spans.

A new iron bridge is to be built across Duck River at Columbia, Tenn., at a cost of about \$21,000. Plans and estimates will be made immediately and contracts will then be let.

The county court has decided to construct an iron bridge over Tradewater River at McKnight's mill, Christian County, Ky.

The Louisville, Ky., Bridge & Iron Co. has been given a contract to build two iron viaducts, 800 and 500 ft. long, at Muldraugh's Hill, Ky., on the Chesapeake, Ohio & Southwestern road.

#### Manufacturing and Business.

The committee which has in charge the purchasing of all tools, machinery, etc., needed in the new locomotive shops at Altoona, Pa., and which recently visited the shops and foundries of the manufacturers of machine tools in this country, has placed an order with the National Machinery Co., of Tiffin, Ohio, for the bolt cutters, tappers, etc., required in the new shops. This company has just published a new and full catalogue of bolt and nut machinery.

The Betts Machine Co., Wilmington, Del., has also received a large order from the Pennsylvania for machinery for this shop. The order comprises lathes, planers, boring mills and horizontal and radial drills. Delivery will be made some time during the fall.

Hoopes & Townsend, of Philadelphia, have purchased the entire plant of the Hare & Morgan Co., of Wilmington, Del., and will operate it under the name of the Hoopes & Townsend Co. as an addition to the works at Philadelphia, and the firm hopes to make it a valuable adjunct to the present plant.

The business of the Gardner Co., 643 West Forty-eighth street, New York City, is to be continued by Herrick & Bergen, who will make specialties of wood car ceilings, car paneling, depot seating and car seating, the same as has been done by the old firm. Mr. John M. Gardner remains with the new firm, and will represent it in dealings with railroad companies and car builders.

The Lidgerwood Manufacturing Co. has enlarged its principal office at 96 Liberty street, New York, and it has also opened a branch in Boston at 197 Congress street, in charge of Mr. J. H. Houghton, who will also represent the Gorton & Lidgerwood Co., makers of the "Gorton" house heating steam boiler. Moses P. Johnson, 717 North Second street, St. Louis, has been appointed representative in that city.

The Lehigh Valley Croosoting Co. has removed its Perth Amboy office to Jersey City, foot of Washington street, south of the Gap.

The Thomson-Houston Electric Welding Co. was organized last week by the election of the following directors: Oliver Ames, S. Endicott Peabody, B. F. Spinney, J. N. Smith, W. A. Boland, Charlton T. Lewis, S. A. Van Hoffman, S. D. Babcock, Henry D. Hyde. Hon. Oliver Ames was chosen President, W. A. Boland, Treasurer. The capital stock is \$1,500,000.

The National Pipe Bending Co., of New Haven, Conn., report the sale of over 40 National feed-water heaters during June, aggregating over 4,500 h. p. This number includes two of 500 h. p. each, one of 400 h. p., and one of 300 h. p., all of which were for electric light plants. The company reports a very good trade in their specialty of manufacturing coils and bends of iron, brass and copper pipe.

The firm of Colwell & Canning, dealers in railroad equipment at 115 Broadway, New York City, has been dissolved, and the business will be carried on by Reginald Canning & Co., Mr. Canning's associate being Mr. John S. Dodge.

Last week the Louisville & Nashville let the contracts for work on its new station at Broadway and Tenth street, Louisville, Ky., to the following Louisville firms: Jacob Hoertz, brick laying; Carpenter & Annear, galvanized iron work; Belknap & Dumesnil, ashblasts and trimmings of stone; Charles Connor, slating; Peter & Burghard, stone masonry; S. Schulhafer, plumbing and gas-fitting; Snead & Co., iron work; Wood & C., carpentering; Jacob Bickel, grading; and Peter Pfeiffer, stone. The United States Tile & Costic Co., of Indianapolis, will do all the tile flooring. Healy & Millet will furnish the stained and plated glass, and the Rendell Co., of New York, the skylights.

#### Iron and Steel.

The Continental Iron Works, of Brooklyn, have just shipped to Hammond & Coon, Lake Erie Boiler Works, Buffalo, N. Y., 16 corrugated boiler furnaces, to be used in the boilers of the new Old Colony line steamer which this company is building.

Benjamin Atha & Co. are erecting a Boulton ingot-casting apparatus at their steel works in Newark, N. J. Sir George Elliott, who was interested with Cyrus W. Field in laying the first Atlantic cable, has purchased a half interest in the Boulton patents for Great Britain, and he now has machines building for Vickers & Kemp and for Jessup.

The machinery and equipments for the pipe foundry of the West Superior (Wis.) Iron & Steel Co., which have been under construction in Scranton and Pittsburgh for six months past, are now being shipped, and will commence to arrive in about 10 days. It will then take about 10 days to get the material in shape for operation, much of the machinery being of a massive character.

The Clinton Iron & Steel Co., of Pittsburgh, has been chartered. The capital stock is \$3,000. The directors are Edwin W. Smith, Charles S. Crawford and Charles C. Morrow.

On July 6, Fannie Furnace, at West Middlesex, Pa., which is 18½ x 60 ft. and is operated under lease by the Wheeler Furnace Co., of Sharon, Pa., produced 114 tons of No. 1 foundry iron.

Conestoga Furnace, owned and operated by Peacock & Thomas, at Lancaster, Pa., has been blown out for repairs, after a successful blast of six years and seven months. As soon as repairs are completed the furnace will be put in blast again.

Notices have been posted in Kurtz & Sons' Valley Iron Works, Worth Bros. Viaduct and Brandywine Mills, and Huston & Sons' Iron and Steel Mills, at Coatesville, Pa., that an increase of 25 cents per ton will be paid hereafter in the puddle department of their works. The former price paid was \$3.25 per ton. The mills of the above firms are all

running on full time. Kurtz & Sons contemplate erecting another large iron and steel mill in the near future.

The Nashville Furnace Co. has elected H. W. Butteroff President and Manager, and J. Q. Moore, Secretary and Treasurer. The stock of ore and coke will soon be laid in, preparatory to blowing in one of the furnaces, which will be done in about ten days. This will be followed by the blowing in of the second in a short time.

The Reading Iron Co., which has been organized to succeed the Reading Iron Works, whose property was recently sold at foreclosure, has elected George F. Baer, of Reading, Pa., President. The following are the directors: Austin Corbin and A. A. McLeod, of the Philadelphia & Reading road, and Simon Seyfert and Geo. C. Clymer, of Reading. The following officers have been chosen: General Manager and Treasurer, Frank C. Smink; Superintendent of Tube Department, Edward W. Wolf; Superintendent of Furnace Department, Albert Broden; Superintendent of the Rolling Mill Department, Simon Seyfert; Superintendent of the Scott Works Department, John G. West. Up to this time 1,500 applications have been received for work, all of whom have signed the agreement not to connect themselves with labor organizations or to become intoxicated either on or off duty.

All but three iron and steel firms about Pittsburg have signed the annual wage scale of the Amalgamated Association of Iron and Steel Workers. These firms are Shoenberger & Co., A. M. Byers & Co. and the Linden Steel Co. The first-named firm has announced that it will not sign the steel scale unless it is made to slide the same as the one agreed to for the Homestead Mill of Carnegie, Phipps & Co.

#### Trials with an Electric Mine Locomotive.

Trials conducted with an electric locomotive recently completed for work in the coal mines at Wharfedale, England, have given the following data: On a grade of 1 in 70 the engine was just capable of moving a train of 20 loaded cars, weighing together about 120 tons. With a train of 15 cars, weighing 93 tons, a speed of about 2.7 miles per hour was realized. A 1,000-volt current was used. On grades of 1 in 40 and 1 in 25, with loads of 40 and 30 tons respectively, a speed of nearly 2 miles per hour was obtained. On a level stretch the maximum weight which could be pulled was a little over 180 tons. The locomotive itself weighed only 2.5 tons, and was operated on the accumulator plan.

#### Electric Power Transmission.

According to all accounts important progress in the matter of electric power transmission is being made in Austro-Hungary. Water power is largely employed for driving the dynamos, and the distances over which the electric current is led range up to 2 miles. The installations make up in number what they lack in extent, and afford some illustration of the growing popularity of the system.

#### Cast Steel Wheel Patents.

The Commissioner of Patents has just decided on the final appeal the case of the patents on the cast steel car wheel in favor of the Fowler Cast Steel Car Wheel Co., of Chicago. The decision affirms that of the Board of Examiners and of Examiner of Interferences. It is said that after the Fowler wheel had been publicly produced the Pittsburgh company began producing car wheels of a substantially similar character, and by methods secured under the Fowler patents. The Pittsburgh company subsequently became the assignee of Clifton B. Beach, of Cleveland, O., who had before received certain letters patent pertaining to car wheels of a different type. The Commissioner in his decision says that an interval of nearly four years had elapsed between the abandonment of the claims of Beach's first application and the filing of the application involved in this interference. Meanwhile Fowler had conceived the invention in controversy, reduced it to practice, entered upon the use of it on an extensive scale and applied for and obtained a patent. Therefore the decision was rendered in favor of the Fowler Co.

#### More Vestibule Suits.

A suit has been begun in the United States Court at Chicago, by the Pullman Palace Car Co., against the Wagner Palace Car Co., and the Michigan Central. The Pullman Company now claims to cover by its patents the entire vestibule. Suit has also been entered at Boston against the Boston & Albany. Former suits resulted in a decree restraining other companies from the use of the buffer controlled by the Pullman company, but have not prevented the successful use of the vestibule itself.

#### Railroad Engineering in the Colleges.

We have received from the University of Wisconsin, Madison, Wis., a circular, giving some information of a change in the technical courses at that institution. Heretofore the college has maintained four engineering courses, civil, mechanical, mining and metallurgical. Three new courses are now introduced, viz., railroad engineering, railroad mechanics and electrical engineering. The railroad engineering course, which is a four years' course, is identical with that in civil engineering for the first two years. In the last two years subjects of comparatively less importance to railroad engineers will be omitted and the civil engineering of railroads proper will be treated at length. The same plan is adopted for the course in railroad mechanics which is also a four years' course, and is a variation from the regular course in mechanical engineering. This departure is one that has already been made by the Massachusetts Institute of Technology, and is bound to be followed by other colleges.

#### The Servis Tie Plate.

The use of this plate is extending with a rapidity which indicates that the trials made with it have been satisfactory. Orders have been received during the past few days by the Dunham Manufacturing Co. for a large number, the Rio Grande & Western alone ordering 200,000 plates, or enough to equip about 40 miles of their new track on the State Line extension. The experience of the roads that have tried the plate recently only goes to confirm the results obtained years ago on the Fitchburg and the Intercolonial.

#### Pig Iron Production, First Half of 1889.

Mr. Swank, Manager of the American Iron and Steel Association, returns our make of pig-iron for the first six months of this year as 3,667,767 gross tons. The make for the three last half years is as below, in gross tons:

First half of 1888.	Last half of 1888.	First half of 1889.
3,020,092	3,469,646	3,667,767

That is, our increased make over the last half of 1888 is 198,121 tons, or about 6 per cent., while the increase over the corresponding six months of 1886 is 21 per cent. Our stock on hand, however, has increased during the last six months from 300,144 to 502,934 tons, so that stock on hand would have increased slightly if there had been no increase in production. This increase has been in mill and foundry iron, there having been a decrease in Bessemer pig. This will be unexpected to some, as the shipments from the Lake Superior mines are proceeding at a rate that justifies the prediction that the shipments for this year will exceed 6,000,000 tons as against 5,000,000 in 1888 and 4,000,000 in 1887.

The following states show an increased production: Con-

necticut, New York, New Jersey, Pennsylvania, Virginia, West Virginia, Alabama, Tennessee, Ohio, Wisconsin, Missouri, Oregon and Washington Territory; the most marked gain occurring in Alabama, New York, New Jersey and Ohio.

Of our 581 blast furnaces, 288 are in blast, or 49.5 per cent. In England, of their 826 furnaces now returned as built, 52.4 per cent. were in blast at the end of June. The number built, however, has been decreased by 31 during the past three years. If we continue production at the present rate through the year, we shall make 7,335,534 tons as against 7,898,634 made in England last year.

#### A Pontoon Bridge at Kansas City.

A scheme is under consideration for the construction of a pontoon bridge across the Missouri, at the northern limits of Kansas City. The projector is Mr. S. M. Stewart, of Leavenworth, who estimates that the bridge can be built for \$26,000. Business men of the city have appointed a committee to investigate the scheme.

#### An Electrical Railroad for Kansas City.

Contracts have been let for building an electrical railroad, 3½ miles, double track, called the Northeast Electric Railway, in Kansas City. The road is estimated to cost \$250,000, and to be completed by Jan. 1, 1890. It is to have a steam plant of 300 H. P. and three 80 H. P. dynamos. The Thomson-Houston system will be used, the equipment to consist of 10 cars. Mr. W. B. Knight is the Chief Engineer of the road.

#### Large Iron Works at San Francisco.

The Anglo-Pacific Steel Co., of San Francisco, Cal., organized some time ago, has now secured a location at Vallejo, opposite Mare Island, the city having given 100 lots and more having been purchased. A tract of 350 acres has been secured southwest of Vallejo, with a water frontage of 4,000 ft. The company expects to begin preparations within two months, and will probably have a portion of the plant in operation Jan. 1. The first structures erected will be four main buildings, entirely of iron, 64 by 500 ft. in area. The investment, including plant and material, will amount to about \$1,000,000. The new town of Sheffield will be regularly laid out in blocks 250 by 500 ft., with avenues 60 and 70 ft. in width. Railroad tracks running into the works and to the wharves will be built connecting with the Southern Pacific road, which runs through Vallejo. The purpose of this company is to manufacture steel rails, steel plates, beams, shafts for vessels and other articles. It is largely composed of the English capitalists who also control the Moss Bay Coal and Iron Co., in Washington Territory, where smelting works will be erected.

#### THE SCRAP HEAP.

##### Notes.

A snow shed, 1,000 ft. long, on the Union Pacific, near Laramie, Wyo., was burned last week.

Wm. P. Hill, a brakeman on a passenger train, was shot and killed at Macon, Mo., last week by a passenger whom he was trying to put off for non-payment of fare.

A railroad velocipede, ridden by two men, was derailed on a trestle 90 ft. high on the Oregonian (3-ft. gauge) Railroad recently, and fell to the gulch below. One of the men survived.

Workmen on the Nashville & Knoxville Railroad, in digging through a high bluff on the banks of the Caney Fork River, near Lebanon, Tenn., discovered an Indian burying ground. The bluff is about 100 ft. high, and the graves were found about 40 ft. from the top.

The Southern Pacific is building two new parlor cars for the use of the California State Board of Trade in exhibiting products of that country throughout the East. The cars will be sent out in October, and will visit sections not touched by the exhibit which is now on the road.

Proceedings on "information" were instituted at Jackson, Miss., on Saturday last, by the Attorney-General of Mississippi against the New Orleans & Northeastern Railroad Company for violation of the law of Mississippi in aiding and abetting the Sullivan and Kilrain prize fight. A judgment of forfeiture and ouster is prayed for. It is asserted that the company combined with Bud Renaud, John L. Sullivan, Jake Kilrain and others to encourage fighting with fists, hands and feet for a stake and for hire and reward; that it ran a special train and did conceal from the public and the authorities the plan and place; and that it afterward carried the combatants out of the state in a way to prevent their apprehension for their crime.

At Steubenville, O., this week some coal barges going down the Ohio River were stopped by piles which the Pittsburgh, Cincinnati & St. Louis Railroad had driven for the purpose of replacing a span of its bridge. The officers of several boats combined and ran their boats against the piling, tearing out a large number, damaging the pile driver and making a channel. The road at once ordered the construction of a V-shaped apron which would effectually turn the boats under the other spans of the bridge, though these side channels have not enough water to float them. The press dispatches state that the road had permission from the Secretary of War to put up the false work, but Washington reports say that it was understood that a channel should be kept open.

#### Business Disturbances in Texas.

The recent action of the Texas legislature in compelling railroad managers in that state to stay at home, as it were, has caused some companies considerable inconvenience; but absentee landlordism is not the Texan's only trouble, it seems. Railroads sometimes have to move their offices for other reasons than legislative pique, and in the case of some, at least, of the Texas towns, the truth is that troubles never come singly, now bears down with crushing severity, as witness the following item from the Tyler Reporter:

##### A BITTER DISAPPOINTMENT.

A Palestine barkeeper had out an order for a carload of jugs, but on hearing the decision of the Supreme Court in the railroad suit he telegraphed to the jug house:

"The receivership has gone to Tyler, and Palestine has gone to h— . Don't ship the jugs."

#### Locomotives Which Talk.

According to a French journal, Edison's latest invention is the Linguagraph, a small apparatus consisting of several pipes, brass wires and a key-board. With the device is a box for holding the phonograms, arranged in proper order for the runner's use. On the exterior is a kind of trumpet into which steam passes when the runner touches the keys. If, for example, the train approaches a tunnel, the runner touches the key which operates the phonogram "tunnel," and in a voice of thunder, which can be heard for several miles, the locomotive shouts "tunnel." On reaching a station, the apparatus announces, in loud tones, whence it comes. On the road, if there is any danger or complication, it tells the trainmen and passengers what they must do: keep their seats or jump out. Moreover, an express train will call out the names of stations which it passes without stopping, and

when two trains meet, they will exchange friendly salutations.

Perhaps the vocabulary of the locomotive can be still further enlarged so that it can streak across the country expounding the laws as to highway crossings and trespass on tracks. A variety of minor editorials on such matters of public interest might be delivered with imposing effect by a judicious selection of the "phonograms."

#### Car Shops Burned.

The car shops of the Eastern Division of the Wabash road, at Butler, Ind., were almost entirely destroyed by fire July 17. Several coaches and much valuable machinery were burned. The loss will be nearly \$100,000.

#### The Scripps League.

In the Scripps League Workingmen's Expedition, which sailed yesterday on its excursion to Europe and the Paris Exhibition, the department of foundry work is represented by Mr. R. E. Masters, of the Marshall Car Wheel & Foundry Co., of Marshall, Tex. Car building is represented by Mr. William Milligan, of the Michigan Car Co., Detroit. Locomotive engineers are represented by Mr. Joseph Thorp, of the Mobile & Ohio Railroad.

#### To Explore the South.

The *Manufacturers' Record*, of Baltimore, has organized an exploring expedition through the mineral and timber regions of the South. The work is expected to last six or eight months, and is under the direction of Major G. B. West, of Birmingham.

### RAILROAD LAW—NOTES OF DECISIONS.

#### Injuries to Passengers, Employees and Strangers.

In Missouri the Federal Court decides that where a passenger on a train breaks out with eruptions, and the best medical advice that can be and is obtained is unable to disclose whether they proceed from small-pox, and where from any prior conduct of such passenger, or any statement he had made, there is a well grounded, clear and honest belief that small-pox is developing, the officers of the train are justified in ejecting him; but they must eject him where there is every reasonable ground to believe that he can find accommodations.<sup>1</sup>

In Ohio the Federal Court holds that in a collision between a railroad train and a street car, at a street crossing, if the railroad servants are negligent the negligence of the street car driver cannot be imputed to a passenger in the street car, who is injured. But the railroad company is not liable if the injury to the passenger was due solely to the negligence of the street car driver.<sup>2</sup>

In Texas the Federal Court rules that a railroad may legally set apart one or more cars for the use exclusively of colored passengers, and a like number, more or less, as the service may require, for the use exclusively of white passengers; but whenever the company enforces such a rule it is charged with the duty of furnishing to colored people who pay first-class fare cars to ride in that as safe and comfortable in their conditions and appointments as the cars furnished to white passengers who pay first-class fare.<sup>3</sup>

In Mississippi the plaintiff and his wife were prevented from leaving a train at the rear platform, when they attempted it, by the throng getting on, and, being carried by the conductor refused to stop and let them off, but promised to send them back from the next station on the next train. He failed to make the arrangement, and the plaintiff paid fare. The Supreme Court holds the railroad liable for actual damages.<sup>4</sup>

The Supreme Court of Florida decides that a rule adopted by a railroad company, which inhibited passengers on its train from wearing the uniform cap of a line of steamers running in opposition to a line of steamers running in connection with the company, was not reasonable, and hence is illegal and not binding.<sup>5</sup>

In Virginia a firm made a written contract with a railroad, the consideration of which was "a ticket, entitling either one of said firm, but only one on any train, to occupy one seat, and travel on the passenger trains of said railroad company." The Supreme Court of Appeals holds that the firm was entitled to only one ticket, which was to be presented whenever any one of the firm took passage on defendant's trains. It appeared that under the contract the railroad issued to the firm an annual pass, on the expiration of which the firm applied for and secured a renewal, but on the expiration of the latter, did not apply for another renewal. On this point the court rules that the question whether it was the duty of defendant to issue a renewal without application was to be determined by the jury, on the practical construction put upon the contract by the parties.<sup>6</sup>

In North Carolina, a passenger being called on for his ticket, explained to the conductor that he had left it in the pocket of his coat at W., the terminus of his trip, that he could and would get it as soon as he reached W., and there deliver it to him, or that he would deposit with him money of the value of the ticket, to be returned if he should produce the misplaced ticket at W., as agreed. The money was tendered the conductor, but he refused to receive the same, and forced him off the train several miles from his destination. The Supreme Court held the company liable.<sup>7</sup>

In Georgia plaintiff was a passenger on defendant's train. Just before the train reached plaintiff's station, the conductor called out the name of the station, and notified him that the train would stop there. When the train had passed by the platform 165 yards, plaintiff jumped off on an embankment and broke his leg. After he jumped the train stopped and ran back on a side track. The Supreme Court held that the plaintiff cannot recover damages.<sup>8</sup>

In Missouri the Federal Court holds that where a passenger is wrongfully expelled from a Pullman car of a train by the officers of the company operating the road, the Pullman Car Co. is not liable; and, if expelled by the officers of the latter, the railroad company is not liable.<sup>9</sup>

In Georgia the Supreme Court rules that the fact that a person killed by the careless running of a locomotive was one of the employees of the company would not preclude his widow from recovering damages, though he may have been in some degree negligent, the homicide occurring on a public street, remote from the place at which the deceased rendered service to the company, and at a time when he was off duty, and had no concern with the business or affairs of the company.<sup>10</sup>

In Texas the Supreme Court decides that a brakeman on a freight train is a fellow-servant, within the rule of the master's liability for negligence, with one having general charge of the company's freight business in the locality of the accident at issue, with authority to employ and discharge hands in connection with such business.<sup>11</sup>

In Kentucky a brakeman was injured while between an engine and car for the purpose of uncoupling the car, the engine moving backward in obedience to a lantern signal by another brakeman. He sought to recover on the ground that the other brakeman was incompetent, which was known to the company. There was no evidence of negligence of the engineer, and every question offered by either side was sub-

mitted to the jury. The Court of Appeals affirms a verdict in favor of the railroad.<sup>12</sup>

The Supreme Court of Indiana holds that a railroad cannot avoid liability for injuries to a servant from a defective brake, on the ground that it was the duty of its inspector to see that the brake was in repair, and that the inspector was a co-servant of the injured person.<sup>13</sup>

- <sup>1</sup> Paddock v. A. T. & S. F. R. Co., 37 Fed. Rep., 811.
- <sup>2</sup> Whelan v. N. Y., L. E. & W. R. Co., 38 Fed. Rep., 15.
- <sup>3</sup> Houck v. South Pac. Co., 38 Fed. Rep., 236.
- <sup>4</sup> Miss. & T. R. Co. v. Gill, 5 South. Rep., 393.
- <sup>5</sup> South. Fla. R. Co. v. Rhoads, 5 South. Rep., 633.
- <sup>6</sup> Knopf v. R. F. & P. R. Co., 8 S. E. Rep., 787.
- <sup>7</sup> Knowles v. Norfolk S. R. Co., 9 S. E. Rep., 7.
- <sup>8</sup> Savannah, F. & W. R. Co. v. Waters, 9 S. E. Rep., 129.
- <sup>9</sup> Paddock v. A. T. & S. F. R. Co., 37 Fed. Rep., 811.
- <sup>10</sup> Savannah & R. Co. v. Flanagan, 9 N. E. Rep., 471.
- <sup>11</sup> G. H. & S. A. R. Co. v. Farmer, 11 S. W. Rep., 186.
- <sup>12</sup> Osborne v. Penn. Co., 11 S. W. Rep., 207.
- <sup>13</sup> Cinn., H. & D. R. Co. v. McMullen, 20 N. E. Rep., 287.

### General Railroad News.

#### MEETINGS AND ANNOUNCEMENTS.

##### Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

- Atlanta & West Point, 3 per cent., payable July 5.
- Louisville & Nashville, 3 per cent., payable Aug. 19, in stock.
- Rock Island & Peoria, 2½ per cent., payable July 1.
- Rome, Watertown & Ogdensburg, 3 per cent., payable Aug. 15.
- St. Paul, Minneapolis & Manitoba, quarterly, 1½ per cent., payable Aug. 1.
- Terre Haute & Indianapolis, semi-annual, 3 per cent., payable Aug. 1.

##### Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

- Housatonic, special meeting, Bridgeport, Conn., Aug. 13.
- New Brunswick, annual meeting, St. John, N. B., Aug. 1.
- Utica & Unadilla Valley, special meeting, 146 Broadway, New York, July 29.

##### Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

- The New England Roadmasters' Association will hold its next meeting in Boston, Aug. 21.
- The Roadmasters' Association of America will hold its seventh annual convention at Denver, Colo., Sept. 10.
- The Master Car and Locomotive Painters' Association will hold its next annual convention in Chicago Sept. 11.
- The American Association of General Passenger and Ticket Agents will hold its next semi-annual meeting in Atlanta, Ga., Sept. 17.
- The New England Railroad Club meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month, except June, July and August. The next meeting will be held Sept. 11.
- The Western Railway Club holds regular meetings on the third Tuesday in each month, except June, July and August, at its rooms in the Phenix Building, Jackson street, Chicago, at 2 p. m.
- The New York Railroad Club meets at its rooms, 113 Liberty street, New York City, at 7:30 p. m., on the third Thursday in each month.
- The Central Railway Club meets at the Tift House, Buffalo, the fourth Wednesday of January, March, May, August and October.
- The American Society of Civil Engineers holds its regular meeting on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, New York.
- The Boston Society of Civil Engineers holds its regular meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m., on the third Wednesday in each month.
- The Western Society of Engineers holds its regular meetings at its hall, No. 67 Washington street, Chicago, at 7:30 p. m., on the first Tuesday in each month.
- The Engineers' Club of St. Louis holds regular meeting in St. Louis on the first and third Wednesdays in each month.
- The Engineers' Club of Philadelphia holds regular meetings at the house of the Club, 1,122 Gerard street, Philadelphia.
- The Engineers' Society of Western Pennsylvania holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Penn Building, Pittsburgh, Pa.
- The Engineers' Club of Cincinnati holds its regular meetings at the Club rooms, No. 24 West Fourth street, Cincinnati, at 8 p. m., on the fourth Thursday of each month.
- The Engineers' Club of Kansas City meets at Kansas City, Mo., on the first Monday in each month.
- The Civil Engineers' Society of St. Paul meets at St. Paul, Minn., on the first Monday in each month.
- The Montana Society of Civil Engineers meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.
- The Civil Engineers' Club of Kansas holds regular meetings on the first Wednesday in each month at Wichita, Kan.

The Committee on Stock List of the New York Stock Exchange has listed for dealings the following securities:

- Eastern Railway Company of Minnesota.—An additional \$100,000 first division first-mortgage 5 per cent. gold bonds, making the total amount listed \$4,250,000.
- Mexican National.—An additional \$100,000 first-mortgage 6 per cent. gold bonds, making total to date \$1,300,000.
- East Tennessee, Virginia & Georgia.—An additional \$500,000 equipment and improvement mortgage 5 per cent. gold bonds, making total amount up to date \$3,000,000.
- Chicago, Rock Island & Pacific.—An additional \$1,687,000 first-mortgage extension and collateral 5 per cent. bonds, making total amount on list \$31,907,000.

##### New York Stock Exchange.

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##### Master Mechanics' Association.

The Secretary has issued the following list of the committees appointed by President R. H. Briggs for the present year. The name first mentioned is that of the chairman of each committee. One Associate Member has been placed upon each committee, and it is expected that these will use their efforts to obtain scientific data and to furnish information that may be obtained outside of railroad sources:

1. Exhaust-pipes, nozzle and steam passages; best form and size in proportion to cylinders: C. F. Thomas, A. W. Gibbs, Ross Kells, John A. Hull.
2. Compound locomotives; their efficiency as compared with simple engines: J. Davis Barnett, John Player, H. D. Garrett, F. W. Dean.
3. Testing laboratories, chemical and mechanical: Philip Wallis, George Gibbs, G. W. West, D. L. Barnes.
4. Efficiency of the link, as compared with other valve

motions: James M. Boon, David Clark, H. Tandy, John A. Coleman.

5. Advantages and disadvantages of placing the fire-box above the frames: Fred B. Griffith, James Macbeth, W. A. Foster, L. F. Lyne.

6. Relative value of steel and iron axles: John Mackenzie, J. N. Graham, John S. Cook, Thomas Shaw.

7. Brick arches in locomotive fire-boxes: T. W. Gentry, Allen Cooke, L. C. Noble, W. A. Smith.

8. The best means, and the economy of preserving locomotive tanks from corrosion: W. J. Robertson, Albert Griggs, O. Stewart, Jerome Wheelock.

9. Purification or softening of feed water: W. T. Small, Harvey Middleton, A. W. Quackenbush, John W. Hill.

10. The best form and size of axles for heavy tenders: W. Swanson, W. Garstang, James Maglenn, L. R. Pomroy.

11. The present state of the "aut mat'c car coupler question," and whether this Association can endorse the action of the M. C. B. Association in recommending the vertical plane type as a standard, from a mechanical standpoint: John Hickey, G. W. Rhodes, Sanford Keeler, M. N. Forney.

#### Buffalo Superintendents' Meeting.

At the meeting of the Buffalo Association of Superintendents last week the prompt handling of cars, demurrage and car service associations were the principal topics discussed. Several members of the Local Freight Agents' Association were present and gave information about the working of car service associations at various cities, as well as individual views. The practice in handling bulk cars at various stations was described. On Wednesday a number of the members, with their wives, were taken by Superintendent J. B. Morford, of the Michigan Central, on an excursion to Toronto, going by train to Niagara Falls and by steamer across Lake Ontario.

#### General Baggage Agents' Association.

The semi-annual convention of the National Association of General Baggage Agents was held last week in Detroit. No business of special importance was done, the time being taken up with discussions on regulations for the transportation of corpses, the course to be pursued where pieces of baggage weighing over 250 lbs. each are shipped over foreign lines, and the division of excess baggage collections. It was stated that certain trunk lines collect money at New York on excess baggage of emigrants going to far western points and retain the entire amount.

#### Traveling Passenger Agents.

The Traveling Passenger Agents' Association met in annual convention at Mackinac, Mich., last week, and adjourned to meet in Buffalo in August, 1890. The officers elected were as follows: President, J. R. Wood, Detroit; Vice-President, George E. Gilman, Detroit; Secretary and Treasurer, H. C. Holabird, Cincinnati.

### PERSONAL.

—Mr. E. G. Thompson, Superintendent of the St. Louis Bridge & Tunnel Co., died in St. Louis July 13, and was buried at Seymour, Ind.

—Mr. J. W. Simons, formerly Trainmaster of the Columbus & Cincinnati Midland, has been appointed Superintendent of the Cairo, Vincennes & Chicago.

—Mr. Samuel D. Mayer, Master of Transportation of the Cleveland & Canton, has resigned that position to accept a Division Superintendency on the Chesapeake & Ohio.

—Mr. J. A. Fulton, Bridge Engineer of the Toledo, St. Louis & Kansas City, has resigned and accepted a similar position on the Lake Shore & Michigan Southern.

—Mr. Charles S. Dwight, Chief Engineer of the New Orleans, Fort Jackson & Grand Isle road, has been chosen Superintendent, in addition to his duties as Chief Engineer.

Joseph York, conductor on the New York, Pennsylvania & Ohio, began his railroad work on the Baltimore & Ohio in 1837, and has been in the service almost continuously ever since, 52 years.

James T. Flaherty, who has been a trainman since 1867, and a passenger conductor on the Grand Rapids & Indiana for 13 years (running in that time 544,755 miles), has never seen a passenger or an employé injured.

—Mr. T. W. Whisnant, for many years Roadmaster of the western division of the Carolina Central, has been promoted to the Superintendency of that road to fill the vacancy caused by the death of Col. L. C. Jones, late Superintendent.

—Mr. J. B. Henry has been appointed New York agent of the Virginia, Tennessee & Georgia Air Line, in place of I. R. Westlake, deceased. Mr. Henry is one of the most popular men in his fraternity in New York City, having been for a long time Contracting Agent for this line. His promotion is well deserved and one which will prove of value to the company.

—The New York Aqueduct Commissioners, at a meeting this week, abolished the office of Consulting Engineer, which has been held by Col. Benjamin S. Church since last November, when he relinquished the post of Chief Engineer to take the latter place. Colonel Church was Chief Engineer of the new aqueduct from its inception. The date of the abolition is to be Aug. 1.

—Chief Engineer Elbridge Lawton, U. S. N. (retired), died at his home in South Boston on July 21, after a long illness. He was born in 1826, and entered the navy as Third Assistant Engineer in March, 1845. He was appointed a Second Assistant Engineer in September, 1849, and became First Assistant Engineer in February, 1851, and Chief Engineer in August, 1856.

—Alexander Thomson, the eldest son of Mr. Frank Thomson, Vice-President of the Pennsylvania, died suddenly in London Thursday night, July 19. He was 19 years of age, and has been abroad for the benefit of his health since last November, passing the winter in Egypt and the south of France.

—A telegram from Kanab, Utah, was received in Denver, July 22, announcing that Mr. Frank M. Brown, President of the Denver, Colorado & Pacific, was drowned in the Colorado River, in Marble Cañon, on July 10, by his boat being capsized while running a rapid. He was thrown into a whirlpool, and unable to get out of it. All the other boats of the expedition went through the rapids safely. Five days afterward another boat was driven against a cliff, capsized, and two boatmen were drowned before assistance could reach them. Mr. Brown was accompanying the surveying party of the road down the Colorado River. He was 42 years old.

—It was announced this week that Mr. E. T. Jeffrey, General Manager of the Illinois Central, had tendered his resignation, to take effect in October, when it is expected that President Fish will return from Europe. Mr. Jeffrey's entire

railroad career has been spent upon this road, which he became connected with in 1856. He has been General Manager for about three years. Mr. Jeffrey was born in Liverpool, England, April 6, 1843. He entered railroad service in October, 1856, as office boy for the Superintendent of Machinery of the Illinois Central. He has since been apprentice in the machine shops of the company at Chicago, apprentice in the office of the mechanical draughtsman; mechanical draughtsman, and secretary to the Superintendent of Machinery. In 1871 he was promoted to Assistant Superintendent of Machinery. In 1877 he was appointed General Superintendent of the company, and in December, 1885, he was elected General Manager, which position he has held up to the present time. Mr. Jeffrey is a son-in-law of Mr. James C. Clarke, formerly President of the Illinois Central, and now President of the Mobile & Ohio.

### ELECTIONS AND APPOINTMENTS.

**American Express Co.**—The territory covered by the company in the Western states has been divided into four divisions, as follows: The Southwestern division, comprising Pennsylvania, Ohio and Indiana, R. D. Hughes, General Superintendent, Cleveland. The Central division, comprising Illinois, Wisconsin and Michigan, J. L. Trumbull, General Superintendent, Chicago. The Northwestern division, comprising Minnesota, Dakota and Montana, W. A. Naylor, General Superintendent, St. Paul. The Western division, comprising Iowa, Missouri, Kansas and Nebraska, L. A. Garner, General Superintendent, Omaha.

**Augusta & Southeastern.**—The officers of this company are as follows: Rolfe Eldridge, President; Minor Gregory, General Superintendent; J. L. Smith, General Freight and Passenger Agent; W. A. Reed, Secretary and Treasurer. General offices: Gregory, Ark.

**Augusta, Tallahassee & Gulf.**—The officers of this company are as follows: Henry A. Blake, President; Wm. Bailey, Vice-President and General Manager; Robert Cummings, Secretary and Treasurer, No. 10 Wall street, New York; Hon. D. S. Walker, General Solicitor; John M. Cook, Chief Engineer, Tallahassee, Fla.; J. McH. Reinhardt, Auditor, Carabelle, Fla.; F. M. Green, Assistant General Manager, Tallahassee, Fla.

**Baltimore & Ohio.**—The new plan for operating this road, approved by the directors last week, provides for a General Manager for the entire system, and the road is divided into three general divisions, the one west of the Ohio River, known as the Trans Ohio Division; the one east of the Ohio, to Mount Clare, known as the Main Line Division, and the line from Washington to Philadelphia, and including all the New York terminals and properties, to be known as the Eastern Division. There will be General Superintendents in each division, assisted by Division Superintendents, General Superintendent of Motive Power, and Engineers of Maintenance of Way, and Superintendent of Car Service.

**Boston & Maine.**—Geo. L. R. French has been appointed Roadmaster of the Central Massachusetts Division, being transferred from the St. Johnsbury & Lake Champlain Division.

**Cairo, Vincennes & Chicago.**—Edwin A. Hill has been appointed Real Estate Agent of this company, in charge of all its real estate and all matters pertaining to taxation, with office at Cincinnati, Ohio.

**Carolina Central.**—T. W. Whisnant has been appointed Superintendent, with office in Wilmington, N. C., to succeed the late Col. L. C. Jones.

**Central (New Brunswick).**—The following officers were elected this week: C. Ford Stevens, President; F. E. Barker, Vice President, and W. F. Whitehead, Secretary and Treasurer.

**Central New England & Western.**—John S. Wilson, John T. Terry, New York; Henry C. Gibson, Charles C. Harrison, Charles F. Berwind, William T. Carter, William H. Gibbs, Arthur E. Newbold, Charles Henry Hart, Wm. B. Scott, John W. Brock, Philadelphia, Pa., and Arthur Brock, Lebanon, Pa., are the directors for the first year. The officers of the company are: John S. Wilson, New York, President; William W. Gibbs, Philadelphia, Vice-President; Arthur E. Newbold, Philadelphia, Treasurer, and William R. Carlie, New York, Secretary.

**Chattanooga & Lookout Mountain.**—The officers of this company are as follows: E. Watkins, President; Hugh L. Whiteside, Vice-President; H. P. Eager, General Superintendent; J. A. Gillespie, Chief Engineer; Gordon Lee, Secretary; W. O. Peoples, Treasurer; A. J. Baird, Passenger Agent, Chattanooga, Tenn.

**Chicago & Northwestern.**—E. E. Hughes has been appointed Assistant Superintendent of the middle Iowa division, vice H. C. Manbanna, resigned.

**Duluth & Iron Range.**—S. T. Pope, who has been Superintendent, has been appointed General Superintendent.

**Duluth, Milbank, Huron & Chamberlain.**—The company has elected D. W. Dagg, of Milbank, Dak., President.

**Dunkirk, Allegheny Valley & Pittsburgh.**—Charles G. Thayer has been appointed Auditor and Cashier in place of Wm. M. Lester, deceased. The office of the Assistant Treasurer has been abolished.

**Fremont, Elkhorn & Missouri Valley.**—E. T. Horne has been appointed Superintendent of the Sioux City & Pacific, with headquarters at Fremont, Neb. Mr. Horne will also retain the superintendency of the South Platte division of the line.

**Jacksonville & Southeastern.**—D. W. Rider has been appointed Superintendent, with headquarters at Jacksonville, Ill. W. C. Alvord has been appointed General Freight Agent, E. A. Nixon Assistant General Freight Agent.

**Kansas City, Lawrence & Nebraska.**—At the annual meeting of stockholders held at Lawrence, Kan., July 18, the following directors and officers were elected: President, W. H. Chick, Kansas City, Mo.; Vice President, J. M. Webster, New York; Secretary, John M. Jewett, Lawrence, Kan.; Treasurer, I. N. Van Hoesen, Lawrence. Directors: George M. Jewett, New York; W. P. Rice, John F. Richards, Kenneth Allen and C. E. Blackman, Kansas City; O. Shannon, E. D. Thompson, J. B. Powell, F. W. Barteldes and Edwin Brown, Lawrence, and S. J. Wemple, Hastings, Neb.

**Lansing & Northwestern.**—The following officers were elected last week: A. O. Bement, of Lansing, President; Isaac Hewitt, of Maple Rapids, Treasurer, and Ewing H. Thomas, of Oxford, Secretary.

**Louisville, Evansville & St. Louis.**—J. M. Kerr has been appointed Car Accountant.

**Lynchburg & Durham.**—C. C. Dunn, of Philadelphia, has been appointed Auditor of the Penn Construction Co. at Lynchburg, Va. This company is building the road.

**Milbank, Egan & Sioux City.**—William M. Brooks, of Brookings, Dak., was elected President at a meeting held in Huron, Dak., last week.

**Missouri Pacific.**—Frank Stillwell has been appointed Acting Superintendent of the St. Louis terminals, in place of E. G. Thompson, deceased.

**Nebraska, Kansas & Southwestern.**—The directors of this Nebraska company are: William Martindale, H. C. Whitely and A. Hathaway, of Emporia; Charles C. Culp and Phil Q. Bond, of Salina; N. M. Beatty, of Hutchinson, and A. W. Gilbert, of Minneapolis.

**New Orleans, Fort Jackson & Grand Isle.**—The following are the officers of the company: Ex-Gov. H. C. Warmoth, President; Chas. S. Dwight, Superintendent and Chief Engineer; James Wilkinson, Secretary and Attorney; A. Baldwin, Treasurer. The office is at 25 Carondelet street, New Orleans.

**New York, Lake Erie & Western.**—W. L. Derr, formerly Roadmaster of the Delaware division, has been made Assistant Superintendent of the Susquehanna division, in special charge of the Jefferson branch, with office at Carbondale, Pa. George B. Swift has been appointed Trainmaster of the same branch.

**Ogdensburg & Lake Champlain.**—The directors have re-elected B. B. Smalley President; D. D. Ranlett, of St. Albans, Treasurer and Col. George T. Childs Secretary.

**Orange Belt.**—Mr. P. A. Demens having resigned as General Manager, Frank E. Bond has been appointed Superintendent, R. B. Foss has been appointed Master of Transportation, in place of J. N. Finney, resigned. He is also General Freight and Passenger Agent.

**Rio Grande Western.**—The first annual meeting of the Rio Grande Western Railway Company (successor to the Denver & Rio Grande Western) has been held this week at Salt Lake City. The following board of directors was elected: Charles J. Canda, James C. Parrish, Frederic P. Olcott, George Foster Peabody, J. Kennedy Todd, William J. Palmer, New York; Joseph D. Potts, Philadelphia; Barthold Schlesinger, Boston, and D. C. Dodge, Denver. The officers of the new company are: William J. Palmer, President; George Foster Peabody, First Vice-President; D. C. Dodge, Second Vice-President and General Manager; C. W. Drake, Secretary and Treasurer. William Brown has been appointed Assistant General Freight and Passenger Agent, with headquarters in Salt Lake City.

**St. Johnsbury & Lake Champlain.**—Dana J. Flanders has been appointed General Passenger Agent in place of Geo. W. Storer, resigned.

**Savannah, Florida & Western.**—On and after Aug. 1, 1889, the Freight and Passenger Departments of the Savannah, Florida & Western will be operated separately.

W. P. Hardee will continue in charge of the Freight Department, with the title of General Freight Agent, with headquarters at Savannah, Ga.

W. M. Davidson has been appointed General Passenger Agent of the Savannah, Florida & Western, the Plant Steamship Line and People's Line of Steamers. He will for the present continue to discharge the duties of General Traffic Agent for Florida. Until otherwise ordered, his headquarters will be at Jacksonville, Fla.

**Virginia Construction Co.**—At the annual meeting of stockholders held in Richmond, July 16, Col. A. S. Buford was re-elected President and R. L. Traylor Secretary and Treasurer. The directors chosen are Gen. Joseph R. Anderson, John P. Branch, A. L. Boulware, R. H. Temple and C. E. Wingo, Richmond; John Overton, Jr., T. J. Latham and D. T. Parter, Memphis. This company is building the Tennessee Midland road.

**Wabash.**—Frank Morse has been appointed Master Mechanic, with headquarters in Fort Wayne, Ind., to succeed W. L. Morris, who resigned to accept the position of Superintendent of Motive Power on the Detroit, Lansing & Northern.

**Wheeling & Lake Erie.**—A. G. Blair has been appointed Traffic Manager; W. R. Woodford has been appointed General Superintendent, and will have charge of all matters of transportation, maintenance of way and equipment and will also perform the duties of Purchasing Agent. C. A. Wilson, Chief Engineer, will have charge of all new work, reporting directly to the President. He will also have immediate charge of the maintenance of way, reporting to the General Superintendent.

### OLD AND NEW ROADS.

**Alabama, Georgia & Florida.**—The surveyors have reached Bainbridge, Ga., from Columbus, passing through Richland and Cuthbert. The survey is being continued south to Quincy, Fla.

**Alabama Midland.**—The survey for the proposed extension from Montgomery, northwest to Tuscaloosa, has been finished from the former place to Maplesville, about half way between the terminal points. The survey is now in progress between Maplesville and Tuscaloosa. On the line now under construction between Bainbridge, Ga., and Montgomery, track laying has been finished beyond the Chattahoochee River, and a force is now working from that point to meet one working south from Ozark. The Central of Georgia has enjoined the company from proceeding with construction on a section of the line, claiming that it has the prior title to the right of way. A suit to settle the question is now pending in the Alabama Supreme Court.

**Alameda County.**—This California road was sold July 11 to satisfy judgments amounting to \$18,767. George E. De Golia, the only bidder, was the buyer, paying \$8,255. The property will be acquired by the Alameda County Terminal Railroad Co., incorporated last May.

**Baltimore & Potomac.**—The earnings of the road for June, 1889, as compared with the same month last year, were as follows: Gross earnings, June, 1889, \$122,195; June, 1888, \$133,869; decrease, \$11,326. Expenses, June, 1889, \$105,088; June, 1888, \$90,867; increase, \$14,220. Net earnings, June, 1889, \$17,107; June, 1888, \$43,002; decrease, \$25,895.

**Bellville, Centralia & St. Louis.**—The locating survey was completed last week between Mt. Vernon and Bellville, Ill., 60 miles, and grading was begun. It is expected to have the line completed in September.

**Cape Breton.**—Work is being rapidly pushed on the extension of this government line in Cape Breton, between the Straits of Canso and Sydney. Two thousand men are employed on the construction and on the work of building the Grand Narrows Bridge.

**Central (New Brunswick).**—At a meeting of directors, held in St. John this week, it was stated that the road from Norton to Chipman, at the head of Grand Lake, is nearly completed, and application will shortly be made to the authorities at Ottawa for permission to open the line for traffic. It is hoped that by Aug. 1 regular trains will be run. The southern end, from Hampton to St. Martins, formerly known as the St. Martins & Upham, is also being put in complete order. Steel rails are to be laid the whole distance, all but about three miles being finished. The bridges are also being put in first-class condition.

**Central New England & Western.**—Articles of agreement for the consolidation and merger of the Hudson Connecting and Poughkeepsie & Connecticut Railroad companies, forming the Central New England & Western Railroad Co., were filed in New York July 23. The capital stock of the consolidated company is \$1,600,000. The first-named company operates a road from the line of the Poughkeepsie bridge, town of Lloyd, west side of the Hudson River, westward to the town of Hamptonburg, Orange County. The second company has constructed a road from a point on the line of the Poughkeepsie bridge, west of Washington street, Poughkeepsie, northeast to Silvernail's bridge, Columbia County, to a point on the line of the Hartford & Connecticut Western road.

**Chicago, Peoria & St. Louis.**—A resolution was this week filed in Illinois by the company authorizing the issuance of a mortgage for \$1,800,000 in favor of the Central Trust Co., of New York, the bond to bear interest at the rate of 5 per cent., and to run until 1939. It is for the purpose of paying, exchanging and retiring the bonds of said road now outstanding before its consolidation with the Peoria, Springfield & St. Louis, and for purchasing additional equipment and constructing or acquiring additional lines.

**Columbus, Hocking Valley & Toledo.**—It was announced on Saturday in New York that the road would default on its 5 per cent. bonds, due Sept. 1, amounting to \$200,000, and that a receiver would then be appointed. The interest due Aug. 1, amounting to about \$40,000, will be paid. It is reported that several large holders of the securities are taking steps to form a committee of protection to prevent the property from being put into the hands of a receiver by the present management.

**Columbus Southern.**—The company received a lot of 1,000 tons of steel rails at Columbus, Ga., last week. Track-laying will now proceed rapidly, the line being graded from Columbus to Albany, Ga., 87 miles.

**Denver, South Park & Pacific.**—The road was sold at Denver, July 17, United States Master's sale under the foreclosure of a mortgage held by the Farmers' Loan & Trust Co., for \$1,500,000 and by the Central Trust Co. The road was purchased by Messrs. Tappen, Hollister and Furland, representing the old stockholders, for \$3,000,000. The road will continue under the management of the Union Pacific.

**Flint & Pierre Marquette.**—The directors of the Flint & Pierre Marquette will meet this week, and will then declare a semi-annual dividend upon the preferred stock—probably 3 per cent. The net earnings for the first six months of 1888 were only \$180,828. The balance, \$41,142, necessary to pay 3½ per cent. on 63,420 preferred shares, was realized from other income, including interest on \$1,000,000 of land assets. For the second half of 1888 the net earnings were \$264,194. The \$1,000,000 that the company hold as land assets has since been put into the road, and the earnings for the first half of 1889 will not be sufficient to pay the 3½ per cent. semi-annual dividend. It is estimated, however, that the earnings of the latter half of 1889 will enable the company to pay 4 per cent. additional, making the full 7 per cent. for the year.

**Georgia.**—The following roads have applied to the Georgia State Legislature for incorporation: Calhoun & Fairmount; Rome, Subigna & Northern; South Bound; Darien Short Line; Atlanta & Lithonia; Turtle River; Alabama & Atlanta; Waco & Bowden, and Griffin, La Grange & Western.

**Hereford.**—The construction of the line from Cookshire, Ind., north toward the connection with the Quebec Central road is being pushed rapidly.

**Huntsville, Belt Line & Monte Sano.**—This road was completed to the Hotel Monte Sano, in Madison County, Ala., July 20. The road now extends from the Memphis & Charleston station, in Huntsville, to the hotel. The road is 8½ miles long, and has a maximum grade of 4 per cent.

**Indianapolis, Decatur & Western.**—In April last the company defaulted on the interest due on its first mortgage bonds. Subsequently the holders of the bonds demanded of the trustees of the mortgage that they take possession of the road and operate it, under the provisions of the trust, for their benefit. Accordingly, demand was this week made by the trustees, R. B. F. Pierce, of Indianapolis, and B. A. Sands, of New York, upon President Hammond for possession, which request was complied with, and the road and its franchises passed under the control of the trustees.

**Little Rock, Mississippi River & Texas.**—Jay Gould is plaintiff in a suit in the Federal Court at Little Rock against this company to recover \$425,000. He asks that a mortgage which he holds on the land in Arkansas, owned by the company, to secure payment be foreclosed. The land was granted the company by the state some years ago, and embraces many thousand acres. It is timber and agricultural land, and is very valuable. The plaintiff recites in his petition, that in May, 1885, the company was indebted to E. Atkins and T. G. Dexter, of Boston; E. H. Winchester, of Exeter, N. H., and J. E. Redfield, of Connecticut, in the sum named in the mortgage, which was given the four persons named to secure payment, Henry Wood being made trustee, and that mortgage was assigned to the plaintiff, who now prays for a decree for the sale of the land, unless the indebtedness and interest is paid on a day to be fixed by the court. The road is part of the Missouri Pacific system.

**Los Angeles, Pasadena & Glendale.**—Grading is to commence immediately on this road between Los Angeles and Pasadena, Cal., the contracts having been let last week John Cross, of 27 West Second street, Los Angeles, is President.

**Louisville & Nashville.**—In addition to the contracts for the first 12 miles of the Cumberland Gap extension let last, contracts for thirteen more were let this week. The first 8 miles of this section were let to Winston Brothers & Co., of Minneapolis, Minn., and the remaining 5 miles to Walton & Co., of Roanoke, Va. Much of the work on the extension will be sublet.

**Lynchburg & Durham.**—At a meeting of the directors in Lynchburg, Va., July 15, the President reported that the road was making good progress; that it was now open to Brookneal, and would be completed to South Boston by Sept. 1. The President was authorized to call on the Penn Construction Co. for rolling stock and rails in advance of the

stipulated time for their delivery, and to issue bonds accordingly.

**Missouri, Kansas & Texas.**—Much of the grading is completed on the Lancaster and Waxahachie extension and tracklaying is to commence this week.

**Norfolk & Western.**—The following is the route which will be followed in building to Mt. Airy, N. C., to connect with the Cape Fear & Yadkin Valley: From a point on the Cripple Creek extension at Ivanhoe, Va., up New River 21 miles to the mouth of Meadow Creek (near Oldtown, in Grayson County), thence southeasterly through Low Gap to Blue Ridge, and easterly to a point on the North Carolina line, four miles from Mount Airy, where it will connect with the Cape Fear & Yadkin Valley.

**Oregon, Short Line & Utah Northern.**—The stockholders of all the companies which are to be consolidated to form this company have all voted this week in favor of the project.

**Oregon & Washington Territory.**—Preliminary surveys are being made in the Blue Mountains, with a view of determining the most feasible route into Grande Ronde Valley. Track-laying is in progress between Fulton and Pendleton, Oregon, a distance of seven miles, and will be completed about Aug. 1. Grading is in progress on the Dayton extension. G. W. Hunt, of Walla Walla, is the contractor.

**Pennsylvania.**—The statement of the business of all lines of the company east of Pittsburgh and Erie for June, 1889, as compared with the same month in 1888, shows a decrease in gross earnings of \$1,149,382, a decrease in expenses of \$344,790, a decrease in net earnings of \$804,662. The six months of 1889, as compared with the same period of 1888, show an increase in the gross earnings of \$146,032, an increase in expenses of \$428,325, a decrease in net earnings of \$282,293. All lines west of Pittsburgh and Erie for the six months of 1889 show a deficiency in meeting all liabilities of \$437,694, being a decrease, as compared with the same period of 1888, of \$144,608. C. S. Slaymaker, of Lancaster, Pa., is to begin another survey this week, for the proposed extension of the Downingtown & Lancaster from Downingtown to Lancaster, 11 miles. The object of the new survey is to avoid some deep cuts in the route of the line first run.

**Q'Appelle, Regina & Long Lake.**—Morton, Rose & Co., of London, England, have raised all the money to build this road from Regina, on the Canadian Pacific, to Prince Albert, 250 miles. The contract for the whole work, including rails, stations, tanks, grading, bridging, etc., has been let to James Ross, who built the Canadian Pacific in the same district and over the Rocky, Selkirk and Gold mountains, and who lately finished for the Canadian Pacific their short line in Canada. Men have been sent up to start the work. The contract is to be completed in December, 1890.

**Savannah, Americus & Montgomery.**—Engineers of this company are surveying for a proposed belt line at Cordale, Ga., to connect the Georgia, Florida & Southern on the north of the town with this line at the south end.

**South Carolina.**—E. R. Dunham, who has been some time examining the earning capacity of the road for the first and second mortgage bondholders, has just finished his work, and started for New York. The plan proposed is to assist the stock and income bondholders to foreclose under the second mortgage bonds, on which January interest was defaulted, and to readjust the first and second mortgages on the basis of \$5,000,000 first and \$2,000,000 of second mortgage bonds at 5 per cent.

**Spring Grove, Avondale & Cincinnati.**—A receiver has been appointed on the application of Ralph C. McCracken, a bondholder of the company and the holder of a judgment against it. The plaintiff alleged in his petition that the directors of the company have not held a meeting for six years and have practically abandoned the road. The road was sold at foreclosure sale on Jan. 27, 1886, and was purchased by the bondholders for \$5,000.

**Texarkana & Northern.**—Grading was commenced on this road last week, at the crossing of the Red River, a few miles north of Texarkana, Tex.

**Toronto, Hamilton & Buffalo.**—The survey has been finished from Welland, Ont., to the Humber River at Toronto. The company has an office in Hamilton. The New York Central & Hudson River is said to have made a contract with the company by which it will have running rights over the road from Niagara Falls to Toronto when it is opened for traffic, which, it is claimed, will be within a year. The distance between Toronto and the Suspension Bridge by the new line will be 74 miles, 11 miles shorter than the present route.

**Vaudreuil & Prescott.**—Grading was commenced last week. The line is to run from Vaudreuil, Ont., to Ottawa, a distance of 87 miles. The cost of construction is placed at \$2,000,000. Foster & Charlebois having the contract for the whole work, which is to be completed before the end of 1890. The road will be nine miles shorter than the Canada Atlantic between Ottawa and Montreal. The company is endeavoring to secure 500 men to work on construction at once.

**Wabash.**—Receiver McNulta has issued his report of the receipts and disbursements of the road for the month of June. This is his last report as receiver, as it carries the accounts up to the time the road was turned over to the management of the Wabash Western. The statement shows that the balance on hand May 31 was \$270,765; receipts for the month, \$821,272; disbursements, \$820,395, leaving a cash balance of \$272,162. The receipts from Jan. 1, 1887, to June 30, 1889, were \$23,330,235, and the disbursements, \$22,958,073.

**Western & Atlantic.**—The House Committee of the Georgia Legislature, which has under consideration the lease of the road, made its report July 18. The bill provides for a minimum rental of \$35,000 per month, the lease to run 30 years. It is understood that the Louisville & Nashville, Queen & Crescent, Central of Georgia and Richmond & Danville will be among the bidders. The Western & Atlantic is the property of the state, and has been operated for 20 years by a company of which Senator J. E. Brown is President. The lease expires next year.

**Whitefield & Jefferson.**—The company has obtained a charter for an extension to Gorham and Berlin, thence up the Androscoggin River to Waumbec Falls through the towns of Cambridge, Dumme and others to Umbagog Lake, thence to some point on the Canadian line at Waumbec Falls.

**Wyoming & Southern.**—This company has just been incorporated in Wyoming to build a road from the terminus of the Big Horn & Southern near the Montana state line, thence along the eastern base of the Big Horn mountains to Buffalo, and to Casper, the present terminus of the Fremont, Elkhorn & Missouri Valley road.

## TRAFFIC.

### Traffic Notes.

The reduced rate of 22 cents per 100 lbs. on live stock from Kansas City to Chicago went into effect by all the roads on July 19. It is stated that the rates at all other Missouri River points will be maintained at the former basis of 27½ cents.

Three miles of trains loaded with foreign ore for the Bethlehem Iron Co. recently blockaded the south-bound track of the North Penn Railroad, between Hellertown and Bethlehem.

August 1 has been finally agreed upon as the date for the restoration of east-bound rates by all the lines on everything except corn, which remains at 20 cents. The Grand Trunk, however, insists on raising the corn rate also.

The American Live Stock Commission Co., composed of a Texas cattle syndicate, has leased 400 common stock cars from the Chicago & Alton. It is said that the surplus on the Alton is owing to the fact that shippers insist on using the palace stock cars owned by private companies.

The Fort Worth & Denver, which recently withdrew from the Inter-state Commerce Railway Association, has announced slight reductions on freight between the Atlantic seaboard and Colorado points, via steamer to Galveston. The reductions on the various classes vary from 2 to 12 cents per 100 lbs.

Every shipper in Prescott, A. T., with two or three exceptions, has signed bonds in the sum of \$1,000 to ship no goods by freight over the Prescott & Arizona Central for a period of six months from July 23. This is done to force the road to give lower freight rates. Freight teams will be put on between Prescott and Ash Fork on the Atlantic & Pacific.

The weighing bureau at Cleveland weighed during the month of June 17,000 tons of freight, on which the shippers' weights were only about 14,000 tons, the exact increase being 19.83 per cent. About 89 per cent. of the goods were in car-loads. It is estimated that the amount of freight saved is over \$3,000, while the expenses of the bureau were only \$516.

### The Inter-state Commerce Commission

The Inter-state Commerce Commission on Tuesday announced its decision in the case of the New York Produce Exchange against the New York Central & Hudson River and the other trunk lines, alleging unjust discrimination in the inland proportion of export rates. The case was heard over a year ago. The opinion states that from Nov. 4, 1887, to Feb. 20, 1888, the trunk lines made through export rates of which the inland (railroad) proportion often was 10 cents or more per 100 lbs. less on like traffic than the published tariff rates charged at the same time to the same port (New York). It is held that the discrepancy between the proportion of the through rate accepted and the established tariffs for consignments to New York proper is not proven to have been justified by any circumstances tending to show that it was just or proper, and that it must, therefore, be deemed an unjust and unlawful discrimination against local consignees.

Commissioner Schoonmaker, who writes the opinion, does not definitely discuss the amount of the discrimination, but summarizes some of the reasons for the decision, as follows:

The proportion of the export trade to which the exceptional rate is sought to be applied is very small in comparison with the general transportation business to the seaboard, and relatively small in proportion to the export business itself.

There is no reason to believe, founded upon any evidence in the case, that foreign markets cannot be profitably reached by our surplus products upon a fixed inland tariff rate to the seaboard with the current ocean rate added, but, on the other hand, there is affirmative evidence that no difficulty has been experienced in reaching those markets advantageously upon a rate so made.

The demand for an exceptional export rate is not shown to be founded upon any necessity of the business, but, as would seem, is urged argumentatively by certain railroads on their own account, and has for its object supposed advantages to particular lines rather than the general interest of the public.

The competition of like products through Canadian ports, though important in amount, is not shown to involve conditions so peculiar and controlling in their character as to require an exceptional rule for the business in question. The percentage of exports through Montreal for a period of thirteen years has been very nearly uniform, and whatever irregularities there may be in that competition they are susceptible of correction by appropriate legislation.

The transportation of property from the interior to the seaboard at the same inland rate for the interior exporter and the seaboard exporter produces no injustice to either, and gives neither any advantage over the other, and the competition between interior and seaboard exporters is left to the control of natural forces and natural laws, without artificial helps or hindrances to either, and enterprise and energy may contend on an equal footing for the success to which they are entitled.

### The Inter-state Commerce Railway Association.

The ore and bullion traffic has been made the subject of another decision by Chairman Walker, published July 19, in which he says:

"By agreement of all the lines interested in east-bound shipments of bullion and ore from Denver and Pueblo, the question of what rates should be established and charged thereon was submitted on July 12. It seems necessary to make an award upon the facts then appearing, although the situation is a complicated one and the parties are not altogether in accord in their statements. The bullion rate is not difficult to fix. A rate of \$8 has heretofore been general, and though reductions have been recently made, that rate is not an unreasonable one, in view of the value of the product, the distance involved, the recent advance in the market price of lead, the rates considered fair at other points, and the just claims of the carriers who are most interested in the traffic. The ore rate is a more uncertain element. There is nothing upon which the arbitrator can base a conclusion except the experience of traffic managers. Fortunately, however, in this there is no disagreement. All the lines concur in the belief that with a bullion rate of \$8 the most satisfactory ore rate is \$5, while it is the unanimous opinion that the late fluctuations have been demoralizing to the commercial interests involved, affording another illustration of the fact that unsteadiness of freight rates is injurious to the public. The true course at the present time, undoubtedly, is to restore the rates to their former basis of \$8 and \$5 respectively. The obstacle to this restoration, if one exists, arises from the action of the Leadville and Denver lines. Such matters are usually arranged by a through rate less than the added locals, in which case the question becomes one of divisions merely. The considerations which have hitherto prevented such an adjustment may hereafter be overcome."

CHAIRMAN WALKER ON METHODS OF MEETING THE CHICAGO & ALTON'S REDUCTIONS.

The following extracts have been published as from an

address by Chairman Walker, printed in the official report of the meeting of the association held in Chicago July 11:

"It cannot be said that the efficacy of the idea under which this association was organized has yet been adequately tested. It was anticipated that difficulties would be encountered, and they have not come sooner or in more urgent form than was expected. The action of the Chicago & Alton Co. of itself presents a most potent illustration of the importance of such an association as this. The position of the Chicago & Alton is substantially that of a determination to maintain its former allotment of traffic under greatly changed conditions. In its most attractive form, the Chicago & Alton policy, as announced, is a purpose to purchase what it pleased to consider its proportion of Kansas City traffic by reducing the rates charged to shippers thereon. There was no sufficient occasion for that company to thus put itself in the field as the antagonist of all the rest. Its action upon the grounds stated in its notice must be conceded even by its friends to be precipitate and uncalled for. Unless wiser counsels prevail, however, the only course apparently open to the other Kansas City lines will be to meet the policy of the Alton. If the Alton buys business, the other lines must also buy it.

"Neither the Chicago & Alton or any other line can inaugurate a rate war without loss. This loss is much more severe under the present legal restrictions controlling traffic by rail than when a local war could be confined to two given points. At the present time the reduction made for the purpose of controlling a given line of traffic not only affects intermediate rates, but also relatively affects other territory in all directions. In this indirect way the act to regulate commerce exercises a control which should prevent any intelligent railway managers from having rate wars; but the lesson it seems has not yet been sufficiently taught, although late experiences have been very severe.

"This Association should, in my judgment, be able to carry on efficiently such a conflict as the Alton threatens to precipitate. The traffic in question is that of a single city. It is apparently proposed by the Alton to use the reflex influences of a rate war upon other lines as a means of compelling them to make desired concessions. Obviously, in meeting this attack of the Alton upon capital and its investments, it becomes the associated lines to seek the most efficient as well as the least expensive methods. Two courses are open, either for all the lines to so arrange their rates and facilities as substantially to control the entire traffic, or for one or more of the lines to be selected and to be employed by the rest to meet the competition. No reason appears why the latter method is not practical; some prestige might accrue in the minds of unintelligent shippers to a line offering low rates, but the knowledge that the other lines were backing it as a war measure against a competitor engaged in promoting the demoralization of railroad and commercial business, should be sufficient to generally distribute whatever fictitious fame might accompany such action.

"The Alton's proposition to reduce the rates on live stock is as yet within the Association rules. Up to the present time the interests of the road as a member of the association have been fully recognized, and no desired protection or assistance has been withheld from the Alton, and its threats have been ignored as unworthy of notice. A reduction in the live stock rates, however, in disregard of the decision of the Western Freight Association, as announced by the Alton, will undoubtedly be accepted, as it is intended to be, as a declaration of war upon the other lines by the Alton. And when war is declared, union and energy in defense are imperative. The occasion is of sufficient importance to require concentration of authority for the common good. I venture to say that the control of the entire situation of all the Kansas City lines might properly be committed to a single manager, with power to control the action of all the lines, or to a committee of presidents at liberty to act for the interest of the entire system as occasion might require, and that any rate-cutting that the Chicago & Alton indulges in could be answered promptly and effectually by one of the other lines acting for the rest, or perhaps by one line as to one commodity, and another as to the next, without involving a general fall in the schedule except upon the line of the Alton, the aggressor, or by such other course of procedure as the common interest may from time to time appear to require."

Mr. Walker's recommendations were referred to a committee with full power to take such steps under the rules of the association as should most effectually meet the case.

### Organizing Car Service Associations.

Chairman E. D. Moore, of the Chicago Car Service Association, has recently organized similar associations in Davenport, Rock Island, Moline, Ottumwa, Des Moines, Council Bluffs, St. Joseph, Atchison, Leavenworth, Kansas City, Topeka, Hutchinson and Wichita. Mr. Moore is reported as satisfied that 80 per cent. of the Chicago merchants would now vote against a restoration of the old dilatory plan.

### Missouri Rates.

The Railroad Commissioners of Missouri held a hearing at Jefferson City from July 9 to 19, considering the local freight rates of the State and hearing the arguments of railroad men and others. At the adjournment it was reported that a reduction would be ordered amounting to about 10 per cent. on grain, 25 per cent. on live stock and the same on coal; but a subsequent statement of the chairman of the board is to the effect that a formal decision has not yet been agreed upon and that none will be issued for some time.

### Anthracite Coal Tonnage.

Mr. John H. Jones, Chief of Bureau of Anthracite Coal Statistics, furnishes the following statement of anthracite coal production for the month of June, 1889, compared with the same period last year, compiled from returns furnished by the mine operators:

	Month of June, 1889.	1888.	Inc. or Dec.
Wyoming region.....	1,693,892	1,611,272	I. 82,620
Lehigh region.....	551,756	448,592	I. 103,163
Schuykill region.....	787,567	877,784	D. 90,216
Total.....	3,033,216	2,937,648	I. 95,567
Year to June 30, 1889.	1889.	1888.	Inc. or Dec.
Wyoming region.....	8,051,704	10,153,163	D. 2,101,458
Lehigh region.....	2,841,384	1,819,123	I. 1,022,261
Schuykill region.....	4,254,112	4,183,168	I. 70,943
Total.....	15,147,201	16,155,455	D. 1,008,253

The stock of coal on hand at tide water shipping points June 30, 1889, was 833,764 tons; on May 31, 1889, it was 962,066 tons, a decrease of 128,302 tons.

Mr. Jones also furnishes the following statement showing the general distribution of the entire production of anthracite coal for the year ending Dec. 31, 1888:

	Tons.
To Pennsylvania, New York and New Jersey.....	23,053,581
To New England States.....	6,082,440
To Western United States.....	5,039,568
To Southern States, including Delaware, Maryland, Dist. Columbia.....	1,969,829
To Pacific Coast.....	6,930
To Dominion of Canada.....	1,956,405
To foreign ports.....	36,965
Total.....	38,145,718